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Microeconomics
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Microeconomics

Ninth Edition

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Pearson

For Constance, Raph, and Will

—Glenn Hubbard

For Cindy, Matthew, Andrew, and Daniel

—Anthony Patrick O'Brien

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PREFACE

Our approach in this new edition remains what it was in the first edition: to provide students and instructors with a text that delivers complete coverage of economic topics using many real-world examples. Our goal from the beginning has been to teach economics in a "widget-free" way by using real-world business and policy examples.

It's an understatement to say that much has happened in the economy since our last edition appeared. The effects of the Covid–19 pandemic disrupted the economy as nothing else has in the lifetimes of today's students (and instructors). Congress, the Trump and Biden administrations, and the Federal Reserve responded to the severe recession of 2020 with fiscal and monetary policies that were also unprecedented. Partially as a result, the U.S. economy experienced the highest rates of inflation in 40 years.

We have incorporated these developments in the new real-world examples and policy discussions in this edition and also in the extensive digital resources, which include:

- More than 80 author-created application videos of the chapter openers and *Apply the Concept* features
- More than 100 figure animation videos
- More than 15 interactive real-time data graphs
- More than 20 *Solved Problem* whiteboard videos
- Updated examples and policies will appear in a feature titled *Trending* located at the end of each chapter in the etext and MyLab
- Hubbard/O'Brien Blog: Instructors and students will find continually updated content at https://hubbardobrieneconomics.com, including podcast recordings with the authors and occasional guests discussing key economic topics in the news and new *Apply the Concept* and *Solved Problem* features.
- Hubbard/O'Brien on X (formerly Twitter): Instructors and students can follow the authors on X: https://x.com/o_economics.

New to This Edition

Here's an overview of the revisions to this new edition.

- All the chapter openers either feature new companies or have been updated with new information.
- Chapters 1–4 include new *An Inside Look* features to help students apply economic thinking to current events and policy debates as they are presented in news articles.
- There are 19 new *Apply the Concept* features and videos to help students tie economic concepts to current events and policy issues. The *Apply the Concept* features and videos that were retained from the previous edition have been updated.
- There are 7 new *Solved Problems*, and many of those retained from the previous edition have been updated. The *Solved Problem* feature uses real-world products, events, and policies to help students break down and answer economic problems step by step. There are whiteboard videos of select *Solved Problems* that bring these real-world problems to life with audio, background photos, and step-by-step construction of graphs and tables.
- Many of the end-of-chapter *Problems and Applications* have been updated or replaced. In most chapters, one or two problems include graphs or tables for students to analyze. The *Critical Thinking Exercises* have also been updated.

Solving Teaching and Learning Challenges

Many students who take a principles of economics course have difficulty seeing the relevance of key concepts such as opportunity cost, trade-offs, scarcity, and demand and supply to their lives and their careers. This difficulty reduces the willingness of some students to prepare for class and to be engaged during class. We address this challenge with contextual learning, a modern organization of content, engaging pedagogy, and an extensive selection of digital assets.

The Foundation: Contextual Learning and Modern Organization

We believe a course is successful if students can apply what they have learned to both their personal lives and their careers and if they have developed the analytical skills to understand what they read in the media. That's why we explain economic concepts by using many real-world business examples and applications in the chapter openers, graphs, *Apply the Concept* features, *An Inside Look* features, *Solved Problem* features, and end-of-chapter problems. This approach helps students majoring in all disciplines become educated consumers, voters, and citizens. In addition to our widget-free approach, we have a modern organization and place interesting policy topics early in the book to pique student interest.

Here are a few highlights of our approach to microeconomics:

- **A strong set of introductory chapters.** The introductory chapters provide students with a solid foundation in the basics. We emphasize the key ideas of marginal analysis and economic efficiency. In Chapter 4, "Economic Efficiency, Government Price Setting, and Taxes," we use the concepts of consumer surplus and producer surplus to measure the economic effects of price ceilings and price floors as they relate to the familiar examples of rental properties and the minimum wage. (We revisit consumer surplus and producer surplus in Chapter 9, "Comparative Advantage and the Gains from International Trade," where we analyze government policies that affect trade; and in Chapter 15, "Monopoly and Antitrust Policy," where we analyze price discrimination and the effect of market power on economic efficiency.) In Chapter 8, "Firms, the Stock Market, and Corporate Governance," we provide students with a basic understanding of how firms are organized, raise funds, and provide information to investors. We also illustrate how in a market system entrepreneurs meet consumer wants and efficiently organize production.
- **Early coverage of policy issues.** To expose students to policy issues early in the course, we discuss trade policy and tariffs in Chapter 1, "Economics: Foundations and Models"; rent control and the minimum wage in Chapter 4, "Economic Efficiency, Government Price Setting, and Taxes"; government policy responses to global warming and the economics of public goods in Chapter 5, "Externalities, Environmental Policy, and Public Goods"; government policy toward soda and other sweetened beverages in Chapter 6, "Elasticity: The Responsiveness of Demand and Supply"; and health care policy in Chapter 7, "The Economics of Health Care."
- **Complete coverage of monopolistic competition.** We devote a full chapter, Chapter 13, "Monopolistic Competition: The Competitive Model in a More Realistic Setting," to monopolistic competition prior to covering oligopoly and monopoly in Chapter 14, "Oligopoly: Firms in Less Competitive Markets," and Chapter 15, "Monopoly and Antitrust Policy." Although many instructors cover monopolistic competition very briefly or dispense with it entirely, we think it is an overlooked tool for reinforcing the basic message of how markets work in a context that is much more familiar to students than are the agricultural examples that dominate discussions of perfect competition. We use the monopolistic competition model to introduce the downward-sloping demand

curve material usually introduced in a monopoly chapter. This approach helps students grasp the important point that nearly all firms—not just monopolies—face downward-sloping demand curves. Covering monopolistic competition directly after perfect competition also allows for early discussion of topics such as brand management and sources of competitive success. Nevertheless, we wrote the chapter so that instructors who prefer to cover monopoly (Chapter 15, "Monopoly and Antitrust Policy") directly after perfect competition (Chapter 12, "Firms in Perfectly Competitive Markets") can do so without loss of continuity.

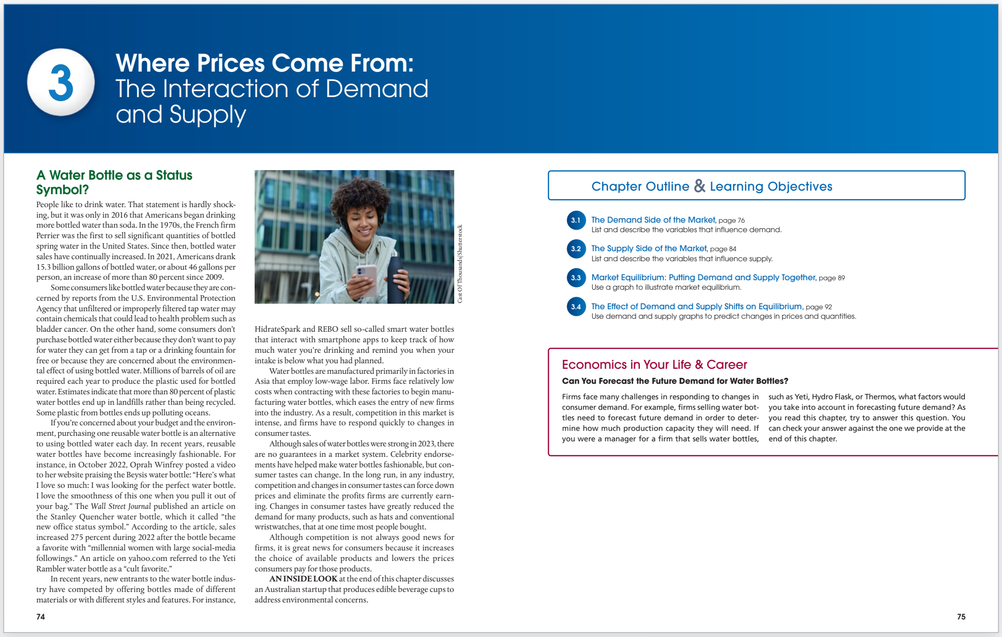
- **Extensive, realistic game theory coverage.** In Chapter 14, "Oligopoly: Firms in Less Competitive Markets," we use game theory to analyze competition among oligopolists. Game theory helps students understand how companies with market power make strategic decisions in many competitive situations. We use familiar companies such as Netflix and Discovery's Max, Pizza Hut and Domino's, and Apple and Samsung in our game theory applications.

Pedagogy That Emphasizes Real-World Examples, Applications, and Practice

A number of pedagogical features illustrate the relevance of economics to students' everyday lives, help students focus on key concepts, and help them prepare for exams.

Business Cases and *An Inside Look* News Articles

Each chapter-opening case provides a real-world context for learning, sparks students' interest in economics, and helps unify the chapter. The case describes an actual company facing a real situation. The company is integrated in the narrative, graphs, and pedagogical features of the chapter. Some of the chapter openers focus on the role of entrepreneurs in developing new products and bringing them to market.



3 Where Prices Come From:
The Interaction of Demand and Supply

A Water Bottle as a Status Symbol?

People like to drink water. That statement is hardly shocking, but it was only in 2016 that Americans began drinking more bottled water than soda. In the 1970s, the French firm Perrier was the first to sell significant quantities of bottled spring water in the United States. Since then, bottled water sales have continually increased. In 2021, Americans drank 15.3 billion gallons of bottled water, or about 46 gallons per person, an increase of more than 80 percent since 2009.

Some consumers like bottled water because they are concerned by reports from the U.S. Environmental Protection Agency that unfiltered or improperly filtered tap water may contain chemicals that could lead to health problem such as bladder cancer. On the other hand, some consumers don't purchase bottled water either because they don't want to pay for water they can get from a tap or a drinking fountain for free or because they are concerned about the environmental effect of using bottled water. Millions of barrels of oil are required each year to produce the plastic used for bottled water. Estimates indicate that more than 80 percent of plastic water bottles end up in landfills rather than being recycled. Some plastic from bottles ends up polluting oceans.

If you're concerned about your budget and the environment, purchasing one reusable water bottle is an alternative to using bottled water each day. In recent years, reusable water bottles have become increasingly fashionable. For instance, in October 2022, Oprah Winfrey posted a video to her website praising the Beysis water bottle: "Here's what I love so much: I was looking for the perfect water bottle. I love the smoothness of this one when you pull it out of your bag." The *Wall Street Journal* published an article on the Stanley Quencher water bottle, which it called "the new office status symbol." According to the article, sales increased 275 percent during 2022 after the bottle became a favorite with "millennial women with large social-media followings." An article on yahoo.com referred to the Yeti Rambler water bottle as a "cult favorite."

In recent years, new entrants to the water bottle industry have competed by offering bottles made of different materials or with different styles and features. For instance, HidrateSpark and REBO sell so-called smart water bottles that interact with smartphone apps to keep track of how much water you're drinking and remind you when your intake is below what you had planned.

Water bottles are manufactured primarily in factories in Asia that employ low-wage labor. Firms face relatively low costs when contracting with these factories to begin manufacturing water bottles, which eases the entry of new firms into the industry. As a result, competition in this market is intense, and firms have to respond quickly to changes in consumer tastes.

Although sales of water bottles were strong in 2023, there are no guarantees in a market system. Celebrity endorsements have helped make water bottles fashionable, but consumer tastes can change. In the long run, in any industry, competition and changes in consumer tastes can force down prices and eliminate the profits firms are currently earning. Changes in consumer tastes have greatly reduced the demand for many products, such as hats and conventional wristwatches, that at one time most people bought.

Although competition is not always good news for firms, it is great news for consumers because it increases the choice of available products and lowers the prices consumers pay for those products.

AN INSIDE LOOK at the end of this chapter discusses an Australian startup that produces edible beverage cups to address environmental concerns.

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Cast Of Thousands/Shutterstock

Chapter Outline & Learning Objectives

3.1 The Demand Side of the Market, page 76
List and describe the variables that influence demand.

3.2 The Supply Side of the Market, page 84
List and describe the variables that influence supply.

3.3 Market Equilibrium: Putting Demand and Supply Together, page 89
Use a graph to illustrate market equilibrium.

3.4 The Effect of Demand and Supply Shifts on Equilibrium, page 92
Use demand and supply graphs to predict changes in prices and quantities.

Economics in Your Life & Career

Can You Forecast the Future Demand for Water Bottles?

Firms face many challenges in responding to changes in consumer demand. For example, firms selling water bottles need to forecast future demand in order to determine how much production capacity they will need. If you were a manager for a firm that sells water bottles, such as Yeti, Hydro Flask, or Thermos, what factors would you take into account in forecasting future demand? As you read this chapter, try to answer this question. You can check your answer against the one we provide at the end of this chapter.

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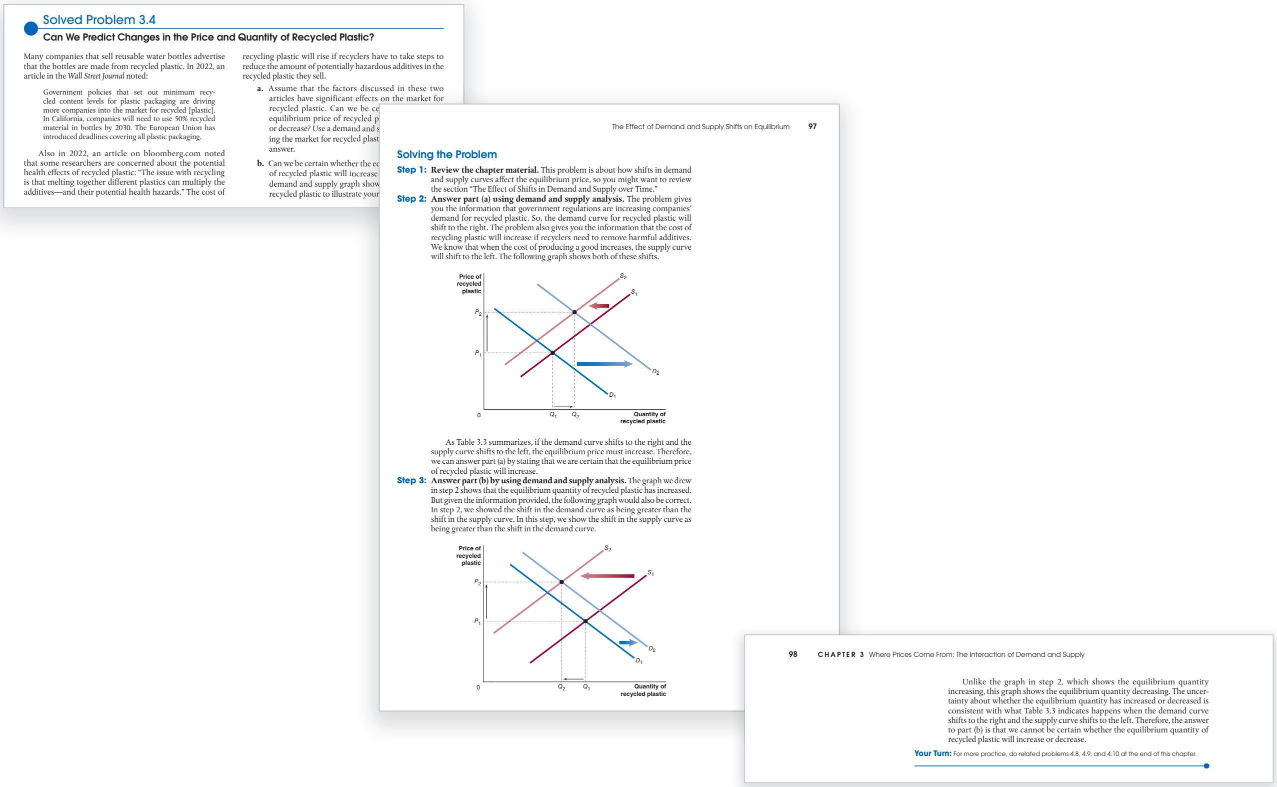
An Inside Look is a two-page feature that shows students how to apply the concepts from the chapter to the analysis of a news article. The feature appears at the end of Chapters 1–4. *An Inside Look* presents an excerpt from an article, analysis of the article, one or more graphs, and critical thinking questions.

Solved Problems

Many students have great difficulty handling applied economics problems. We help students overcome this hurdle by including in each chapter two or three worked-out problems that analyze real-world economic issues they hear and read about in the news. Our goals are to keep students focused on the main ideas of each chapter and give them a model for how to solve an economic problem by breaking it down step by step. We tie additional exercises in the end-of-chapter *Problems and Applications* section to every *Solved Problem*. Additional *Solved Problems* appear in the *Instructor's Manuals*. In addition, the Test Banks include problems tied to the *Solved Problems* in the main book.

Whiteboard videos of select *Solved Problems* bring these real-world problems to life with audio, background photos, and step-by-step construction of graphs and tables.



Solved Problem 3.4

Can We Predict Changes in the Price and Quantity of Recycled Plastic?

Many companies that sell reusable water bottles advertise that the bottles are made from recycled plastic. In 2022, an article in the *Wall Street Journal* noted:

> Government policies that set out minimum recycled content levels for plastic packaging are driving more companies into the market for recycled [plastic]. In California, companies will need to use 50% recycled material in bottles by 2030. The European Union has introduced deadlines covering all plastic packaging.

Also in 2022, an article on bloomberg.com noted that some researchers are concerned about the potential health effects of recycled plastic: "The issue with recycling is that melting together different plastics can multiply the additives—and their potential health hazards." The cost of recycling plastic will rise if recyclers have to take steps to reduce the amount of potentially hazardous additives in the recycled plastic they sell.

a. Assume that the factors discussed in these two articles have significant effects on the market for recycled plastic. Can we be ce
equilibrium price of recycled p
or decrease? Use a demand and s
ing the market for recycled plast
answer.

b. Can we be certain whether the eq
of recycled plastic will increase
demand and supply graph show
recycled plastic to illustrate your

The Effect of Demand and Supply Shifts on Equilibrium 97

Solving the Problem

Step 1: Review the chapter material. This problem is about how shifts in demand and supply curves affect the equilibrium price, so you might want to review the section "The Effect of Shifts in Demand and Supply over Time."

Step 2: Answer part (a) using demand and supply analysis. The problem gives you the information that government regulations are increasing companies' demand for recycled plastic. So, the demand curve for recycled plastic will shift to the right. The problem also gives you the information that the cost of recycling plastic will increase if recyclers need to remove harmful additives. We know that when the cost of producing a good increases, the supply curve will shift to the left. The following graph shows both of these shifts.

As Table 3.3 summarizes, if the demand curve shifts to the right and the supply curve shifts to the left, the equilibrium price must increase. Therefore, we can answer part (a) by stating that we are certain that the equilibrium price of recycled plastic will increase.

Step 3: Answer part (b) by using demand and supply analysis. The graph we drew in step 2 shows that the equilibrium quantity of recycled plastic has increased. But given the information provided, the following graph would also be correct. In step 2, we showed the shift in the demand curve as being greater than the shift in the supply curve. In this step, we show the shift in the supply curve as being greater than the shift in the demand curve.

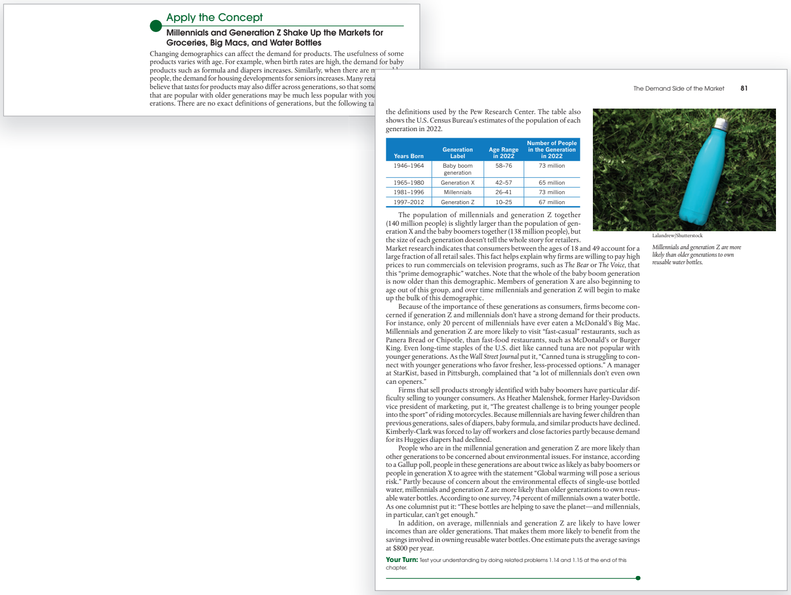
98 CHAPTER 3 Where Prices Come From: The Interaction of Demand and Supply

Unlike the graph in step 2, which shows the equilibrium quantity increasing, this graph shows the equilibrium quantity decreasing. The uncertainty about whether the equilibrium quantity has increased or decreased is consistent with what Table 3.3 indicates happens when the demand curve shifts to the right and the supply curve shifts to the left. Therefore, the answer to part (b) is that we cannot be certain whether the equilibrium quantity of recycled plastic will increase or decrease.

Your Turn: For more practice, do related problems 4.8, 4.9, and 4.10 at the end of this chapter.

Apply the Concept

Each chapter includes two to four *Apply the Concept* features that provide real-world reinforcement of key concepts and help students learn how to interpret what they read on the Web and in newspapers. Most of the more than 70 *Apply the Concept* features use relevant, stimulating, and provocative news stories focused on businesses and policy issues. One-third of them are new to this edition, and most others have been updated. Each *Apply the Concept* has at least one supporting end-of-chapter problem to allow students to test their understanding of the topic discussed.



Apply the Concept

Millennials and Generation Z Shake Up the Markets for Groceries, Big Macs, and Water Bottles

Changing demographics can affect the demand for products. The usefulness of some products varies with age. For example, when birth rates are high, the demand for baby products such as formula and diapers increases. Similarly, when there are m
people, the demand for housing developments for seniors increases. Many reta
believe that *tastes* for products may also differ across generations, so that some
that are popular with older generations may be much less popular with you
erations. There are no exact definitions of generations, but the following ta

The Demand Side of the Market 81

the definitions used by the Pew Research Center. The table also shows the U.S. Census Bureau's estimates of the population of each generation in 2022.

Years Born	Generation Label	Age Range in 2022	Number of People in the Generation in 2022
1946–1964	Baby boom generation	58–76	73 million
1965–1980	Generation X	42–57	65 million
1981–1996	Millennials	26–41	73 million
1997–2012	Generation Z	10–25	67 million

The population of millennials and generation Z together (140 million people) is slightly larger than the population of generation X and the baby boomers together (138 million people), but the size of each generation doesn't tell the whole story for retailers. Market research indicates that consumers between the ages of 18 and 49 account for a large fraction of all retail sales. This fact helps explain why firms are willing to pay high prices to run commercials on television programs, such as *The Bear* or *The Voice*, that this "prime demographic" watches. Note that the whole of the baby boom generation is now older than this demographic. Members of generation X are also beginning to age out of this group, and over time millennials and generation Z will begin to make up the bulk of this demographic.

Because of the importance of these generations as consumers, firms become concerned if generation Z and millennials don't have a strong demand for their products. For instance, only 20 percent of millennials have ever eaten a McDonald's Big Mac. Millennials and generation Z are more likely to visit "fast-casual" restaurants, such as Panera Bread or Chipotle, than fast-food restaurants, such as McDonald's or Burger King. Even long-time staples of the U.S. diet like canned tuna are not popular with younger generations. As the *Wall Street Journal* put it, "Canned tuna is struggling to connect with younger generations who favor fresher, less-processed options." A manager at StarKist, based in Pittsburgh, complained that "a lot of millennials don't even own can openers."

Firms that sell products strongly identified with baby boomers have particular difficulty selling to younger consumers. As Heather Malenshek, former Harley-Davidson vice president of marketing, put it, "The greatest challenge is to bring younger people into the sport" of riding motorcycles. Because millennials are having fewer children than previous generations, sales of diapers, baby formula, and similar products have declined. Kimberly-Clark was forced to lay off workers and close factories partly because demand for its Huggies diapers had declined.

People who are in the millennial generation and generation Z are more likely than other generations to be concerned about environmental issues. For instance, according to a Gallup poll, people in these generations are about twice as likely as baby boomers or people in generation X to agree with the statement "Global warming will pose a serious risk." Partly because of concern about the environmental effects of single-use bottled water, millennials and generation Z are more likely than older generations to own reusable water bottles. According to one survey, 74 percent of millennials own a water bottle. As one columnist put it: "These bottles are helping to save the planet—and millennials, in particular, can't get enough."

In addition, on average, millennials and generation Z are likely to have lower incomes than are older generations. That makes them more likely to benefit from the savings involved in owning reusable water bottles. One estimate puts the average savings at $800 per year.

Your Turn: Test your understanding by doing related problems 1.14 and 1.15 at the end of this chapter.

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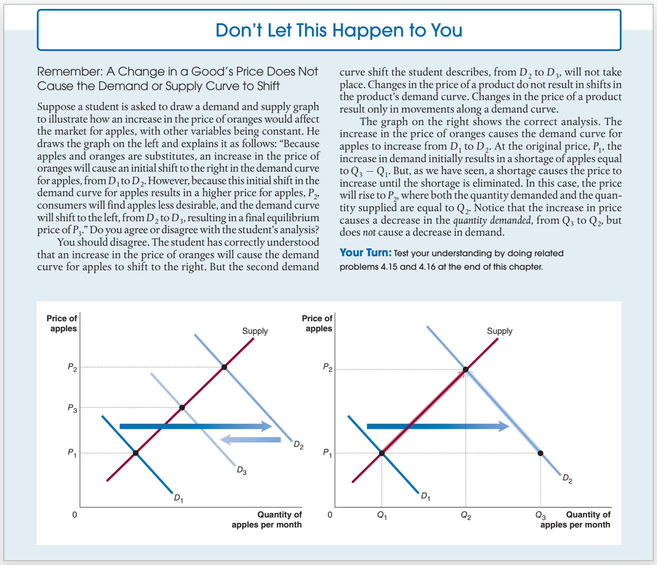
Millennials and generation Z are more likely than older generations to own reusable water bottles.

Don't Let This Happen to You

We know from many years of teaching which concepts students find most difficult. We include in each chapter a box feature called *Don't Let This Happen to You* that alerts students to the most common pitfalls in that chapter's material. We follow up with a related question in the end-of-chapter *Problems and Applications* section.



Don't Let This Happen to You

Remember: A Change in a Good's Price Does Not Cause the Demand or Supply Curve to Shift

Suppose a student is asked to draw a demand and supply graph to illustrate how an increase in the price of oranges would affect the market for apples, with other variables being constant. He draws the graph on the left and explains it as follows: "Because apples and oranges are substitutes, an increase in the price of oranges will cause an initial shift to the right in the demand curve for apples, from D_1 to D_2. However, because this initial shift in the demand curve for apples results in a higher price for apples, P_2, consumers will find apples less desirable, and the demand curve will shift to the left, from D_2 to D_3, resulting in a final equilibrium price of P_3." Do you agree or disagree with the student's analysis?

You should disagree. The student has correctly understood that an increase in the price of oranges will cause the demand curve for apples to shift to the right. But the second demand curve shift the student describes, from D_2 to D_3, will not take place. Changes in the price of a product do not result in shifts in the product's demand curve. Changes in the price of a product result only in movements along a demand curve.

The graph on the right shows the correct analysis. The increase in the price of oranges causes the demand curve for apples to increase from D_1 to D_2. At the original price, P_1, the increase in demand initially results in a shortage of apples equal to $Q_3 - Q_1$. But, as we have seen, a shortage causes the price to increase until the shortage is eliminated. In this case, the price will rise to P_2, where both the quantity demanded and the quantity supplied are equal to Q_2. Notice that the increase in price causes a decrease in the *quantity demanded*, from Q_3 to Q_2, but does *not* cause a decrease in demand.

Your Turn: Test your understanding by doing related problems 4.15 and 4.16 at the end of this chapter.

Concept Checks

For each learning objective section, we provide a Concept Check that is accessible in the corresponding section within the MyLab Economics page. Each Concept Check contains one or two multiple-choice, true/false, or fill-in questions. These checks act as "speed bumps" that encourage students to stop and check their understanding of fundamental terms and concepts before moving on to the next section. The goal of this digital resource is to help students assess their progress on a section-by-section basis so they can be better prepared for homework, quizzes, and exams.

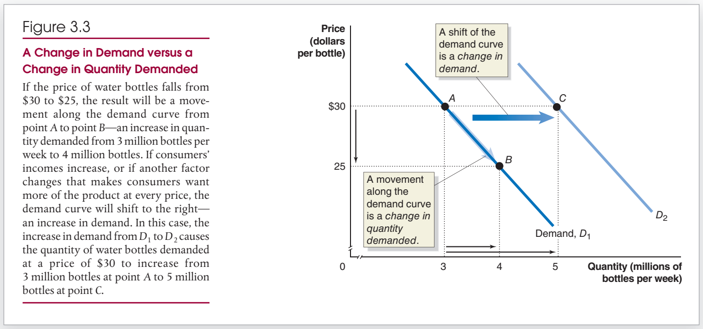


Figure 3.3

A Change in Demand versus a Change in Quantity Demanded

If the price of water bottles falls from \$30 to \$25, the result will be a movement along the demand curve from point *A* to point *B*—an increase in quantity demanded from 3 million bottles per week to 4 million bottles. If consumers' incomes increase, or if another factor changes that makes consumers want more of the product at every price, the demand curve will shift to the right—an increase in demand. In this case, the increase in demand from D_1 to D_2 causes the quantity of water bottles demanded at a price of \$30 to increase from 3 million bottles at point *A* to 5 million bottles at point *C*.

Price (dollars per bottle)
A shift of the demand curve is a *change in demand*.
$30
25
A
B
C
A movement along the demand curve is a *change in quantity demanded*.
Demand, D1
D2
0
3
4
5
Quantity (millions of bottles per week)

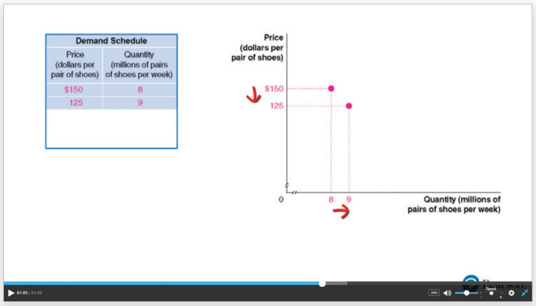
Graphs and Summary Tables

Graphs are an indispensable part of a principles of economics course but are a major stumbling block for many students. Every chapter except Chapter 1 includes end-of-chapter problems that require students to draw, read, and interpret graphs. Video animations or real-time data graphs of the numbered figures appear within the book's MyLab Economics page. We use four devices to help students read and interpret graphs:

1. Detailed captions
2. Boxed notes
3. Color-coded curves
4. Summary tables with graphs, such as Table 3.1 and Table 3.2

Figure Animation 3.1

A Demand Schedule and Demand Curve



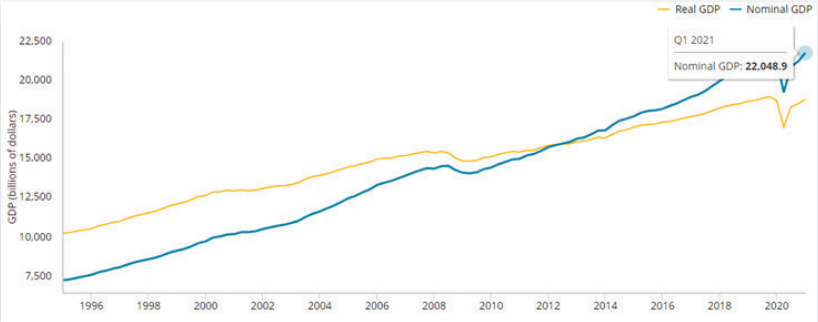
Demand Schedule

Price (dollars per pair of shoes)	Quantity (millions of pairs of shoes per week)
\$150	8
125	9

Price (dollars per pair of shoes)
$150
125
0
8
9
Quantity (millions of pairs of shoes per week)

Here is a screen capture to show one of the many figure animation videos that appear within MyLab Economics and the eText.

Here is a screen capture that shows one of the many interactive real-time data graphs that appears in MyLab and the eText.



Review Questions and *Problems and Applications* Grouped by Learning Objective to Improve Assessment

We group the main end-of-chapter material—*Summary*, *Review Questions*, and *Problems and Applications*—under learning objectives. The goals of this organization are to make it easier for instructors to assign problems based on learning objectives and to help students efficiently review material that they find difficult. If students have difficulty with a particular learning objective, an instructor can easily identify which end-of-chapter questions and problems support that objective and assign them as homework or discuss them in class. Also, student learning will be enhanced by having the summary material and problems grouped together by learning objective, which allows them to focus on the parts of the chapter they find most challenging. Each major section of the chapter, paired with a learning objective, has at least two review questions and three problems.

As in the previous editions, we include one or more end-of-chapter problems that test students' understanding of the content presented in the chapter-opening business vignette and the *Solved Problem, Apply the Concept, Economics in Your Life & Career,* and *Don't Let This Happen to You* special features in the chapter. Instructors can cover a feature in class and assign the corresponding problem(s) for homework. The Test Bank files also include questions that pertain to these special features.

Critical Thinking Exercises

Each chapter includes two or more *Critical Thinking Exercises* that help students build skills in the following areas: (1) analyzing and interpreting information, (2) applying reasoning and logic to new or unfamiliar ideas and situations, (3) examining ideas and concepts from multiple perspectives, and (4) clearly communicating their findings in a brief paper or class presentation.

Developing Career Skills

It is important for students to learn key economic terms, concepts, and models. But for a course to be successful, students need to develop the skills and confidence to apply what they've learned outside the classroom.

After the chapter-opening real-world business case, we have a feature titled *Economics in Your Life & Career* that adds a personal dimension to the chapter opener by asking students to consider how economics affects their lives and careers. The feature piques the interest of students and emphasizes the connection between the material they are learning and their personal and career decisions. At the end of the chapter, we use the chapter concepts to answer the questions asked at the beginning of the chapter.

Chapter 1, "Economics: Foundations and Models," includes a section that describes economics as a career and the key skills students of any major can gain from studying economics. As described earlier, features such as chapter-opening business cases, *Apply the Concept* and *Solved Problem* features, and end-of-chapter problems provide real-world context for learning that exposes students to economics as applied in a variety of large and small businesses, government agencies, and nonprofit organizations. End-of-chapter *Critical Thinking Exercises* help build student skills to analyze and interpret information and apply reasoning and logic to new or unfamiliar ideas and situations.

Instructor Teaching Resources

The authors and Pearson Education have worked together to integrate the text, print, and media resources to make teaching and learning easier.

Supplements Available to Instructors for Download at www.pearson.com	Features of the Supplement
Instructor's Manual Authored by Edward Scahill of the University of Scranton	• Chapter-by-chapter summaries organized by learning objectives • Extended examples and class exercises • Teaching outlines incorporating key terms and definitions, teaching tips, and topics for class discussion • New *Solved Problem*s • New *Apply the Concept* features • Solutions to all review questions and problems
Test Bank Authored by Randy Methenitis of Richland College	• 4,000 multiple-choice, true/false, short-answer, and graphing questions. • Test questions are annotated with the following categories: **Difficulty**—1 for straight recall, 2 for some analysis, and 3 for complex analysis **Type**—multiple-choice, true/false, short-answer, essay **Topic**—the term or concept the question supports **Learning outcome** **Page number** in the main book **Special feature** in the main book **Association to Advance Collegiate Schools of Business (AACSB) Guidelines**, which propose learning experiences in the following categories of Assurance of Learning Standards: Written and Oral Communication; Ethical Understanding and Reasoning; Analytical Thinking; Information Technology; Interpersonal Relations and Teamwork, Diverse and Multicultural Work; Reflective Thinking; and Application of Knowledge
Computerized TestGen	• Allows instructors to customize, save, and generate classroom tests. • Instructors can edit, add, or delete questions from the Test Banks; analyze test results; and organize a database of tests and student results. • Many options are available for organizing and displaying tests, along with search and sort features. • The software and the Test Banks can be downloaded from www.pearson.com.
PowerPoint Lecture Presentations Authored by Paul Holmes of Ashland University	• A comprehensive set of PowerPoint slides can be used by instructors for class presentations or by students for lecture preview or review. These slides include all the graphs, tables, and equations in the textbook. Two versions are available: step-by-step mode, in which you can build graphs as you would on a blackboard, and automated mode, in which you use a single click per slide.

FLEXIBILITY **CHART**

The following chart helps you organize your syllabus based on your teaching preferences and objectives:

Core	Optional	Policy
Chapter 1: Economics: Foundations and Models	**Chapter 1 Appendix:** Using Graphs and Formulas	
Chapter 2: Trade-offs, Comparative Advantage, and the Market System		
Chapter 3: Where Prices Come From: The Interaction of Demand and Supply		
	Chapter 4 Appendix: Quantitative Demand and Supply Analysis	**Chapter 4:** Economic Efficiency, Government Price Setting, and Taxes
		Chapter 5: Externalities, Environmental Policy, and Public Goods
Chapter 6: Elasticity: The Responsiveness of Demand and Supply		
		Chapter 7: The Economics of Health Care
	Chapter 8: Firms, the Stock Market, and Corporate Governance	
	Chapter 8 Appendix: Using Present Value	
	Chapter 8 *Online Appendix*: Income Statements and Balance Sheets	
Chapter 9: Comparative Advantage and the Gains from International Trade		
	Chapter 10: Consumer Choice and Behavioral Economics	
	Chapter 10 Appendix: Using Indifference Curves and Budget Lines to Understand Consumer Behavior	
Chapter 11: Technology, Production, and Costs	**Chapter 11 *Online Appendix*:** Using Isoquants and Isocost Lines to Understand Production and Cost	
Chapter 12: Firms in Perfectly Competitive Markets		
Chapter 13: Monopolistic Competition: The Competitive Model in a More Realistic Setting		

Core	Optional	Policy
Chapter 14: Oligopoly: Firms in Less Competitive Markets		
Chapter 15: Monopoly and Antitrust Policy		
Chapter 16: The Markets for Labor and Other Factors of Production		
		Chapter 17: Public Choice, Taxes, and the Distribution of Income

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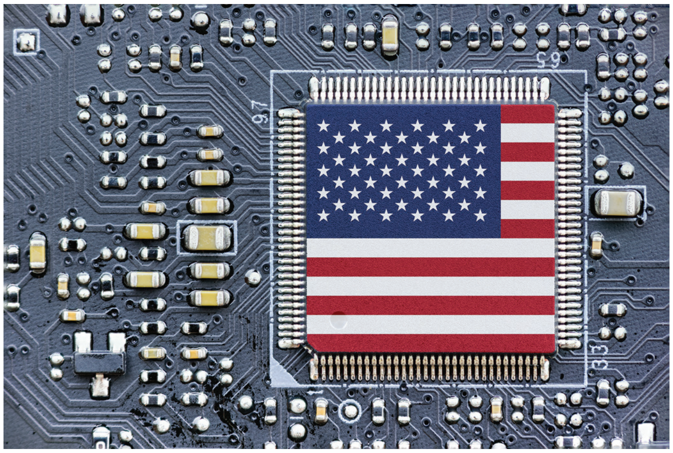
1 Economics: Foundations and Models

Should Apple Manufacture the iPhone in the United States?

If you were asked to list prominent U.S. firms, you would likely include Apple near the top. When Apple began selling computers in the late 1970s and early 1980s, it manufactured them in the United States. Apple released the iPhone in 2007, and it has become one of the best-selling and most influential products of the twenty-first century. Apple designs the iPhone at its headquarters in Cupertino, California, but most iPhones are assembled in China and India, in factories owned by Foxconn, a Taiwanese company.

Many categories of products that were once manufactured in the United States are now manufactured overseas. Donald Trump won the 2016 presidential election in part by pledging to increase manufacturing employment in the United States. One aspect of his strategy was to impose tariffs—in effect, taxes—on imports of some goods from other countries. Tariffs lead to higher prices of imported goods, making it more likely that both U.S. and foreign companies will manufacture goods in the United States rather than in other countries.

During the 2020 presidential campaign, Joe Biden stated he would implement policies that would help create millions of additional manufacturing jobs. Semiconductors are included in most electronic products, including smartphones, and in many other goods, including cars and home appliances. In the summer of 2022, Congress passed the Chips and Science Act of 2022. The act included $53 billion in federal government assistance to private firms willing to construct new semiconductor factories in the United States or to expand existing factories. Several firms, including Intel and GlobalFoundries, which are headquartered in the United States, and Taiwan Semiconductor Manufacturing Company (TSMC) indicated that they would take advantage of the assistance to build new factories in the United States. In December 2022, Apple Chief Executive Officer (CEO) Tim Cook announced that the company would buy chips from a new factory TSMC was building in Arizona. Apple would be the factory's largest customer.


William Potter/Shutterstock

Why do Apple and other U.S. firms manufacture some products, including smartphones and semiconductors, in other countries? Primarily because in a *market system*, firms respond to economic incentives. In the case of Apple, the lower wages earned by Chinese and Indian workers and the experience those workers have with electronics manufacturing significantly reduce the costs of assembling iPhones. Competition among firms in a market system leads firms to search for ways to reduce the costs of producing goods and services. Technological progress often creates economic incentives for firms to change how they produce goods and services. For example, U.S. automobile manufacturers have replaced some workers with robots, reducing employment in the industry. Firms also respond to changes in consumer tastes. When more people began using smartphones rather than computers to connect to the internet, they reduced their demand for computers. Firms like Apple responded by shifting some resources from producing computers to producing smartphones.

In this chapter and the remainder of this book, we will look at how economics provides us with tools to analyze how firms, consumers, and workers respond to economic incentives and how government policymakers can attempt to reach their objectives by changing those incentives.

AN INSIDE LOOK at the end of this chapter discusses whether tax breaks will incentivize pharmaceutical manufacturers to expand domestic manufacturing facilities.

Chapter Outline & Learning Objectives

1.1 Three Key Economic Ideas, page 4
Explain these three key economic ideas: People are rational, people respond to economic incentives, and optimal decisions are made at the margin.

1.2 The Economic Problem That Every Society Must Solve, page 9
Discuss how an economy answers these questions: What goods and services will be produced? How will the goods and services be produced? Who will receive the goods and services produced?

1.3 Economic Models, page 12
Explain how economists use models to analyze economic events and government policies.

1.4 Microeconomics and Macroeconomics, page 16
Distinguish between microeconomics and macroeconomics.

1.5 Economic Skills and Economics as a Career, page 17
Describe economics as a career and the key skills you can gain from studying economics.

1.6 A Preview of Important Economic Terms, page 19
Define important economic terms.

Appendix: Using Graphs and Formulas, page 30
Use graphs and formulas to analyze economic situations.

Economics in Your Life & Career

Should You Consider a Career in Manufacturing?

In the late 1940s and early 1950s, one-third of workers in the United States were employed in manufacturing. Traditionally, many high school graduates have viewed working on a manufacturing assembly line as a way to earn a middle-class income. Many college graduates in fields such as engineering, accounting, and management also work in manufacturing. Will manufacturing be a good career choice for you? In August 2023, total employment in U.S. manufacturing was 13.0 million. But the U.S. Bureau of Labor Statistics (BLS) forecasts that by 2031, this number will *decline* to 12.2 million, even though it forecasts that total employment in all jobs will *increase* by 5 percent. What is the basis of the BLS's forecast of manufacturing employment, and how reliable is it? As you read this chapter, try to answer this question. You can check your answer against the one we provide at the end of this chapter.

In this book, we use economics to answer questions such as the following:

- What determines the prices of goods and services, from smartphones to pizza to automobiles?
- Why do firms engage in international trade, and how do government policies, such as tariffs, affect international trade?
- Why does the government control the prices of some goods and services, and what are the effects of those controls?

Economists do not always agree on the answers to questions like these, and there are lively debates on some issues. Because new economic questions are constantly arising, economists are always developing new methods to analyze them.

Scarcity A situation in which unlimited wants exceed the limited resources available to fulfill those wants.

Economics The study of the choices people make to attain their goals, given their scarce resources.

The topics we discuss in this book illustrate a basic fact of life: To attain our goals, we must make choices. We must make choices because we live in a world of **scarcity**, which means that although our wants are *unlimited*, the resources available to fulfill those wants are *limited*. You might want to own a BMW and a condo near a beach, but unless Elon Musk is a close and generous relative, you probably lack the funds to fulfill these wants. Every day, you make choices as you spend your limited income on the many goods and services available. The finite amount of time you have also limits your ability to attain your goals. If you spend an hour studying for your economics midterm, you have one hour less to study for your history midterm. Firms and the government are in the same situation as you: They must also attain their goals with limited resources. **Economics** is the study of the choices consumers, business managers, and government officials make to attain their goals, given their scarce resources.

We begin this chapter by discussing three important economic ideas that we will return to many times in the following chapters: *People are rational, people respond to economic incentives,* and *optimal decisions are made at the margin*. Then, we consider the three fundamental questions that any economy must answer: *What* goods and services will be produced? *How* will the goods and services be produced? and *Who* will receive the goods and services produced? Next, we consider the role of *economic models* in analyzing real-world economic issues. We then discuss the difference between microeconomics and macroeconomics, and we consider how economic skills can benefit your career. Finally, we preview some important economic terms that will appear throughout this book.

1.1 Three Key Economic Ideas

LEARNING OBJECTIVE: Explain these three key economic ideas: People are rational, people respond to economic incentives, and optimal decisions are made at the margin.

Market A group of buyers and sellers of a good or service and the institution or arrangement by which they come together to trade.

Whether your goal is to buy a smartphone or find a part-time job, you will interact with other people in *markets*. A **market** is a group of buyers and sellers of a good or service and the institution or arrangement by which they come together to trade. Examples of markets are the markets for smartphones, houses, haircuts, stocks and bonds, and labor. Most of economics involves analyzing how people make choices and interact in markets. Here are the three important ideas about markets that we'll return to frequently:

1. People are rational.
2. People respond to economic incentives.
3. Optimal decisions are made at the margin.

People Are Rational

Economists generally assume that people are rational. This assumption does *not* mean that economists believe everyone knows everything or always makes the “best” decision. It means that economists assume that consumers and firms use all available information as they act to achieve their goals. Rational individuals weigh the benefits and costs of each action, and they choose an action only if the benefits outweigh the costs. For example, if Apple charges a price of $999 for its new iPhone, economists assume that the managers at Apple have estimated that this price will earn the company the most profit. Even though the managers may be wrong—maybe a price of $949 or $1,049 would be more profitable—economists assume that the managers at Apple have acted rationally, on the basis of the information available to them, in choosing the price of $999. Although not everyone behaves rationally all the time, the assumption of rational behavior is very useful in explaining most of the choices that people make.

People Respond to Economic Incentives

People act from a variety of motives, including envy, compassion, anger, and religious belief. While not ignoring other motives, economists emphasize that individuals and firms consistently respond to *economic incentives*. This point may seem obvious, but it is often overlooked. For example, you probably see news stories about banks or stores being robbed. You may think that the robbers didn’t take the time to first weigh the economic benefit—the money from the robbery—against the economic cost—the time spent in jail if arrested. Yet, there is evidence that people considering committing crimes do respond to economic incentives. Most states require anyone convicted of a felony to submit a DNA sample. The samples are entered into databases that police check when investigating crimes. DNA databases increase the likelihood that someone who commits a crime will be arrested, thereby reducing the economic incentive to commit crimes by raising the cost. But the DNA will reduce the number of crimes committed only if criminals respond to the increase in cost. Jennifer Doleac, an economist at Texas A&M University, has analyzed the effects of adopting DNA testing and found that “the requirement to submit a DNA sample reduces the likelihood of a new conviction within five years by . . . 17 percent for serious violent offenders.” To an economist, it’s not surprising that even criminals respond to economic incentives.

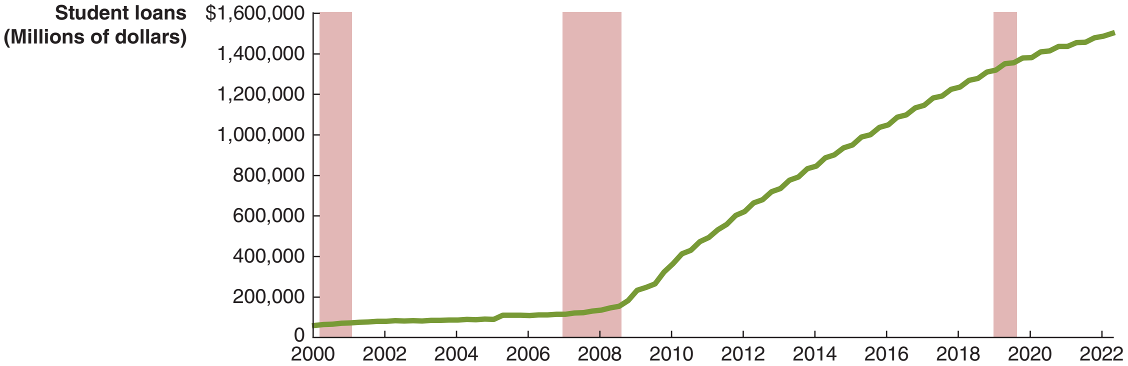
Each chapter has at least two *Apply the Concept* features that discuss a news story or another application related to the chapter material. This *Apply the Concept* discusses the importance of analyzing the incentives provided by a government policy.

Apply the Concept

Will Changes to the Federal Student Loan Program Unintentionally Give Colleges an Incentive to Increase Tuition?

One of our three key economic ideas is that people respond to economic incentives. Government policy can change the economic incentives that people face. For example, taxing cigarettes will cause some people to reduce or quit smoking. A government policy, however, can have *unintended consequences* by changing economic incentives in a way that policymakers didn’t anticipate. Some economists argue that this was the case with the Biden administration’s decision in August 2022 to change the federal student loan program.

In the past 25 years, college students and their parents have rapidly increased their loan debt. The following figure shows the total value of outstanding student loans, beginning in 2000. Student loan debt increased from about $52 billion in 2000 to about $1.5 *trillion* at the beginning of 2023. Or, put another way, for every $1 of student loan debt students and their parents owed in 2000, they owed more than $25 of debt in 2023. In 2022, the average borrower owed about $29,000.



During the Covid–19 pandemic, the Trump and Biden administrations allowed people with student loans to suspend making payments on the loans. The payment moratorium began March 31, 2020, and ended September 30, 2023. Student loan payments are often a recent college graduate's largest bill. Some economists argue that these payments make it harder for young adults to accumulate the down payments necessary to buy homes. As a result, young adults are likely to delay forming families, thereby reducing their need to move from an apartment to a house. In 1967, about 83 percent of people aged 25 to 34 lived with a spouse or partner, while in 2021, only about 54 percent did.

Other economists doubt that student loan debt is the main reason that some young adults have delayed forming families and buying houses. Still, many policymakers consider reducing the burden of student loan debt on young adults an important issue. In August 2022, President Joe Biden announced a plan under which:

- Individuals earning less than $125,000 per year would have up to $10,000 in student loan debt canceled.
- Borrowers with Pell grants would have up to an additional $10,000 canceled.
- Lower- and middle-income student loan borrowers will be able to more easily have their loan balances canceled due to changes in the income-driven repayment (IDR) program. With some exceptions, borrowers with loans of $12,000 or less will have their loans canceled after making payments for 10 years, rather than the current 20 years. The annual payments for most borrowers using the IDR program will be lowered from 10 percent to 5 percent of their income above about $33,000 per year.

Some policymakers objected to President Biden's plan, arguing that it was unconstitutional because it was the result of a presidential executive order rather than the result of congressional legislation. (In June 2023, the U.S. Supreme Court ruled the debt cancellation parts of the plan were unconstitutional.) Many economists focused on a different potential problem with the plan: the economic incentives that might result from the changes to the IDR program. The intention of these changes was to reduce the burden on people who currently have student loans, but the changes also affected the economic incentives presented to students applying for loans and to colleges deciding the level of tuition to charge.

In an article on the Brookings Institution website, Adam Looney, a professor of finance at the University of Utah, argued that because of the changes to the IDR program, a typical college student could expect to pay back only about 50 percent of the amount borrowed. Before the changes, the Congressional Budget Office had estimated that the typical student would end up paying more than 100 percent of the amount borrowed because the student would have to pay interest on the loan amount. Looney argues that students and their parents will have an incentive to borrow *more* because they will expect to pay back only half of the amount borrowed. In particular, Looney notes:

> A large share of student debt is not used to pay tuition, but is given to students in cash for rent, food, and other expenses. . . . While students certainly need to pay rent and buy food while in school, under the administration proposal a student can borrow significant amounts for "living expenses," deposit the check in a bank account, and not pay it all back. . . . Some people will use loans like an ATM, which will be costly for taxpayers and is certainly not the intended use of the loans.

Sylvain Catherine, a professor of finance at the University of Pennsylvania's Wharton School, makes a similar argument: "How can we not anticipate the distortionary effects of such a policy? Students will be encouraged to take more debt since they will not have to repay [all of the additional funds they borrow], and colleges will have an incentive to further increase tuition." An article in the *New York Times* noted that taxpayers will be responsible for the value of student loans that aren't paid back: "By offering more-generous educational subsidies, the government may be creating a perverse incentive for both schools and borrowers, who could begin to pay even less attention to the actual price tag of their education—and taxpayers could be left footing more of the bill."

In late 2023, it was too early to judge the extent to which students, their families, and colleges would react to the changed incentives in President Biden's student debt relief plan. But because the plan changes economic incentives, it may result in consequences not intended by President Biden and his advisers. Lawsuits challenging the constitutionality of the forgiveness plan were also not yet resolved in the courts.

Your Turn: Test your understanding by doing related problem 1.9 at the end of this chapter.

Optimal Decisions Are Made at the Margin

Some decisions are "all or nothing." For instance, when an entrepreneur decides whether to open a new restaurant, she starts the new restaurant or she doesn't. When you decide whether to attend graduate school, you either enroll in graduate school or you don't. But rather than being all or nothing, most decisions in life involve doing a little more or a little less. If you are trying to decrease your spending and increase your saving, the decision is not really between saving all the money you earn or spending it all. Rather, many small choices are involved, such as whether to buy a caffé mocha at Starbucks every day or just once a week.

Economists use the word *marginal* to mean "extra" or "additional." Comparing the *marginal benefit* (*MB*) of an activity to its *marginal cost* (*MC*) can help us make decisions. For example:

- Should you watch another hour of television or spend that hour studying? The *marginal benefit* of watching more television is the additional enjoyment you receive. The *marginal cost* is the reduction in your test score from having studied a little less.
- Should Apple produce an additional 300,000 iPhones? Firms receive *revenue* from selling goods. Apple's marginal benefit is the additional revenue it receives from selling 300,000 more iPhones. Apple's marginal cost is the additional cost—for wages, parts, and so forth—of producing 300,000 more iPhones.

Economists reason that *the optimal decision is to continue any activity up to the point where the marginal benefit equals the marginal cost—that is, to the point where* $MB = MC$.

Often, we apply this rule without consciously thinking about it. Usually, you will know, without giving the decision a lot of thought, whether the additional enjoyment from watching a television program is worth the additional cost you pay by not spending that hour studying. In business situations, however, firms often have to make careful calculations to determine, for example, whether the additional revenue received from increasing production of a good is greater or less than the additional cost of the production. **Marginal analysis** involves comparing marginal benefits and marginal costs.

Marginal analysis Analysis that involves comparing marginal benefits and marginal costs.

In each chapter, you will see at least one *Solved Problem* feature. This feature will increase your understanding of the material by leading you through the steps of solving an applied economic problem. After reading the problem, test your understanding by doing the related problems that appear at the end of the chapter.

Solved Problem 1.1

The Marginal Benefit and Marginal Cost of Opening Walt Disney World during the Covid–19 Pandemic

In mid-March 2020, during the Covid–19 pandemic, the Walt Disney Company closed its Walt Disney World theme parks in Orlando, Florida. During the time the parks were closed, the Disney Company still had to pay for utilities, maintenance of the parks, and wages for some employees. In late May, the company announced that, with the approval of the Florida government, it would reopen Disney World in mid-July. An article in the *Wall Street Journal* noted that the company's costs would increase because to reduce the chance that visitors would contract the virus while in the parks, employees would have to do additional cleaning, reconfigure restaurants and rides, and check customers' temperatures. At the same time, the company's revenue would likely fall because fewer people were expected to buy tickets to the parks or to stay in the company's hotels. After Disney World reopened, could the Disney Company be sure that the revenue it earned would be greater than the costs of operating the parks? If not, why might the Disney Company still have chosen to reopen Disney World?

Solving the Problem

Step 1: **Review the chapter material.** This problem is about making decisions, so you may want to review the section "Optimal Decisions Are Made at the Margin."

Step 2: **Use the information in the problem to explain how the Disney Company should have decided whether to reopen Disney World during the pandemic.** The problem tells us that the Disney Company had costs associated with Walt Disney World even when the parks were closed and the company was earning no revenue from them. So, the company was suffering a loss. Therefore, the company's goal in reopening Disney World was to at least reduce the size of the loss, even if it was not able to earn a profit.

The Disney Company needed to apply marginal analysis when deciding whether to open Disney World. The company's costs would be higher than normal, and its revenue would be lower than normal. But as long as the additional revenue, or marginal revenue, the company earned from the parks being open was greater than the additional cost, or marginal cost, of operating the parks, the company should have chosen to reopen Disney World.

Your Turn: For more practice, do related problems 1.11 and 1.12 at the end of this chapter.

1.2 The Economic Problem That Every Society Must Solve

LEARNING OBJECTIVE: Discuss how an economy answers these questions: What goods and services will be produced? How will the goods and services be produced? Who will receive the goods and services produced?

Because we live in a world of scarcity, any society faces the economic problem that it has only a limited quantity of economic resources—such as workers, machines, and raw materials—and so can produce only a limited amount of goods and services. Therefore, every society faces **trade-offs**: Producing more of one good or service means producing less of another good or service. The best measure of the cost of producing a good or service is the value of what has to be given up to produce it. The **opportunity cost** of any activity is the highest-valued alternative that must be given up to engage in that activity. The concept of opportunity cost is very important in economics and applies to individuals, firms, and society as a whole. For instance, suppose that you earn a salary of $100,000 per year working as a manager for Apple. You decide to leave your job and open your own information technology consulting firm. In this case, the opportunity cost of the labor you supply to your own firm is the $100,000 you give up by not working for Apple, even if you do not explicitly pay yourself a salary. As in this example, opportunity costs often do not involve actual payments of money.

Trade-off The idea that, because of scarcity, producing more of one good or service means producing less of another good or service.

Opportunity cost The highest-valued alternative that must be given up to engage in an activity.

Trade-offs force society to make choices when answering three fundamental questions:

1. What goods and services will be produced?
2. How will the goods and services be produced?
3. Who will receive the goods and services produced?

Throughout this book, we will return to these questions many times. For now, we briefly introduce each question.

What Goods and Services Will Be Produced?

How will society decide whether to produce more economics textbooks or more smartphones? More daycare facilities or more football stadiums? Of course, "society" doesn't make decisions; only individuals make decisions. The answer to the question of what will be produced is determined by the choices of three groups:

1. *Consumers:* You help decide which goods and services firms will produce when you choose to buy an iPhone instead of a Samsung Galaxy or a caffè mocha rather than a chai latte.
2. *Firms:* In response to consumers' choices, Apple must choose whether to devote the company's scarce resources to making more iPhones or more smartwatches.
3. *Government:* Members of Congress and the president must choose whether to spend more of the federal government's limited budget on breast cancer research or on repairing highways.

In each case, consumers, managers of firms, and government policymakers face the problem of scarcity by trading off one good or service for another. And each choice made comes with an opportunity cost, measured by the value of the best alternative given up.

How Will the Goods and Services Be Produced?

Firms choose how to produce the goods and services they sell. In many cases, firms face a trade-off between using more workers and using more machines. For example:

- A local service station has to choose whether to provide car repair services using more diagnostic computers and fewer auto mechanics or fewer diagnostic computers and more auto mechanics.

- A movie studio has to choose whether to produce animated films using highly skilled animators to draw them by hand or using fewer animators and more computers.
- A firm may have to choose between a production method in the United States that uses fewer workers and more machines and a production method in Mexico that uses more workers and fewer machines.

Who Will Receive the Goods and Services Produced?

In the United States, who receives the goods and services produced depends largely on how income is distributed. The higher your income, the more goods and services you can buy. Often, people are willing to give up some of their income—and, therefore, some of their ability to purchase goods and services—by donating to charities to increase the incomes of poorer people. Americans donate more than $450 billion per year to charity, or an average donation of about $3,700 for each household in the country. An important policy question, however, is whether the government should intervene to make the distribution of income more equal. Such intervention already occurs in the United States because people with higher incomes pay a larger fraction of their incomes in taxes and because the government makes payments to people with low incomes and provides services to them, such as Medicaid medical insurance and assistance in buying food through the Supplemental Nutritional Assistance Program (SNAP). There is disagreement over whether the current attempts to redistribute income are sufficient or whether there should be more or less redistribution.

Centrally Planned Economies versus Market Economies

To answer the three questions—what, how, and who—societies organize their economies in two main ways. A society can have a **centrally planned economy**, in which the government decides how economic resources will be allocated. Or a society can have a **market economy**, in which the decisions of households and firms as they interact in markets determine the allocation of economic resources.

Centrally planned economy An economy in which the government decides how economic resources will be allocated.

Market economy An economy in which the decisions of households and firms as they interact in markets determine the allocation of economic resources.

Centrally Planned Economies From 1917 to 1991, the most important centrally planned economy in the world was that of the Soviet Union, which was established when Vladimir Lenin and the Communist Party staged a revolution and took control of the Russian Empire. In the Soviet Union, the government decided what goods to produce, how the goods would be produced, and who would receive the goods. Government employees managed factories and stores. The objective of these managers was to follow the government's orders rather than to satisfy the wants of consumers. Centrally planned economies like that of the Soviet Union have failed to produce low-cost, high-quality goods and services, so the standard of living of the average person in a centrally planned economy tends to be low. All centrally planned economies have also been political dictatorships. Dissatisfaction with low living standards and political repression finally led to the collapse of the Soviet Union in 1991. Today, only North Korea still has a completely centrally planned economy, although in some other countries, such as Cuba and Venezuela, the government has a large role in planning economic activity.

Market Economies All high-income democracies, including the United States, Canada, Japan, and the countries of Western Europe, have market economies. Market economies rely primarily on privately owned firms to produce goods and services and to decide how to produce them. Markets, rather than the government, determine who receives the goods and services produced. In a market economy, firms must produce goods and services that meet the wants of consumers, or the firms will go out of business. In that sense, it is ultimately consumers who decide what will be produced. Because firms in a market economy compete to offer the highest-quality products at the lowest price, they are under pressure to use the lowest-cost methods of production. For example, as we saw in the chapter opener, Apple assembles its iPhones mainly in China and India rather than in the United States.

In a market economy, the income of an individual is determined by the payments he or she receives for what he or she has to sell. If you become a civil engineer, and firms are willing to pay a salary of $85,000 per year for someone with your training and skills, you will have this amount of income to purchase goods and services. If you also buy a house that you rent out, your income will be even higher. One of the attractive features of markets is that they reward hard work. Generally, the more extensive the training you receive and the more hours you work, the higher your income will be. Of course, luck—both good and bad—also plays a role here. Someone might have a high income because she won the state lottery, while someone else might have a low income because he has severe medical problems. We can conclude that market economies respond to the question "Who receives the goods and services produced?" with the answer "Those who are most willing and able to buy them."

The Modern "Mixed" Economy

In the 1800s and early 1900s, the U.S. government engaged in relatively little regulation of markets for goods and services. Beginning in the mid-1900s, government intervention in the economy dramatically increased in the United States and other market economies due primarily to the high rates of unemployment and business bankruptcies during the Great Depression of the 1930s. Some government intervention was also intended to raise the incomes of people who are elderly, people who are sick, and people with limited skills. For example, in the 1930s, Congress established the *Social Security system*, which provides government payments to retired and disabled workers, and enacted *minimum wage* legislation, which sets a floor on the wages employers can pay workers in many occupations. In more recent years, government intervention in the economy has also expanded to meet goals such as protecting the environment, promoting civil rights, and expanding access to medical care.

Some economists argue that the extent of government intervention makes it no longer accurate to refer to the economies of the United States, Canada, Japan, and Western Europe as pure market economies. Instead, these countries are considered **mixed economies** because, while most economic decisions result from the interaction of buyers and sellers in markets, the government plays a significant role in the allocation of resources.

Mixed economy An economy in which most economic decisions result from the interaction of buyers and sellers in markets but in which the government plays a significant role in the allocation of resources.

One of the most important developments in the international economy in recent years has been the movement of China from being a centrally planned economy to being a mixed economy. The Chinese economy suffered decades of economic stagnation following the takeover of the government in 1949 by Mao Zedong and the Communist Party. Although China remains a political dictatorship, the production of most goods and services is now determined in the market rather than by the government. The result has been rapid economic growth that has lifted more than a billion people in China out of poverty. In the past few years, China's leader Xi Jinping has taken steps to increase the role of the government in the economy by expanding the role of firms owned by the government and by placing more restrictions on the activities of private firms. It remains to be seen whether the government having a larger role in the economy will significantly reduce economic growth, which would slow the increase in the standard of living of the average Chinese household.

Efficiency and Equity

Market economies tend to be more efficient than centrally planned economies. There are two types of efficiency:

- **Productive efficiency** occurs when a good or service is produced at the lowest possible cost.
- **Allocative efficiency** occurs when production is in accordance with consumer preferences.

Markets tend to be efficient because they promote competition and facilitate voluntary exchange. With **voluntary exchange**, both the buyer and the seller of a product are made better off by the transaction. We know that they are both made better off because, otherwise, the buyer would not have agreed to buy the product or the seller would not have agreed to sell it. Productive efficiency is achieved when competition among firms

Productive efficiency A state of the economy in which every good or service is produced at the lowest possible cost.

Allocative efficiency A state of the economy in which production is in accordance with consumer preferences; in particular, every good or service is produced up to the point where the last unit provides a marginal benefit to consumers equal to the marginal cost of producing it.

Voluntary exchange A situation that occurs in markets when both the buyer and the seller of a product are made better off by the transaction.

forces them to produce goods and services at the lowest cost. Allocative efficiency is achieved when the combination of competition among firms and voluntary exchange between firms and consumers results in firms producing the mix of goods and services that consumers prefer the most. Competition will result in firms continuing to produce and sell goods and services as long as the additional benefit to consumers is greater than the additional cost of production. In this way, the mix of goods and services produced will match consumer preferences.

Although markets promote efficiency, they don't guarantee it. Inefficiency can arise from various sources. For instance, it may take some time for firms to learn how to efficiently produce a good or service. When smartphones were introduced, firms did not instantly achieve productive efficiency because it took time to discover the lowest-cost method of producing them. As we will discuss in later chapters, inefficiency can also arise if governments interfere with voluntary exchange in markets. For example, many governments limit the imports of some goods from foreign countries. Doing so reduces efficiency by keeping goods from being produced at the lowest cost, a point we discuss further in the *Apply the Concept* "What Can Economics Contribute to the Debate over Tariffs?" in Section 1.3. The production of some goods damages the environment. Without government intervention, firms may ignore the costs of environmental damage and thereby fail to produce the goods at the lowest possible cost. In such situations, government intervention may increase efficiency.

Equity The fair distribution of economic benefits.

Not everyone will consider a particular outcome to be desirable, even if the outcome is economically efficient. Many people prefer economic outcomes that they consider fair or equitable, even if those outcomes are less efficient than other outcomes. **Equity** is harder to define than efficiency because there isn't an agreed-upon definition of fairness. For some people, equity means a more equal distribution of economic benefits than would result from an emphasis on efficiency alone. For example, some people support raising taxes on people with higher incomes to provide funds for programs that aid people with low incomes. Although governments may increase equity by reducing the incomes of people with high incomes and increasing the incomes of people with low incomes, these policies may reduce efficiency. People have less incentive to open new businesses, work hard, and save if the government takes a significant amount of the income they earn from working or saving. As a result, fewer goods and services are produced, and less saving takes place. As this example illustrates, *there is often a trade-off between efficiency and equity*. Government policymakers frequently confront this trade-off.

1.3 Economic Models

LEARNING OBJECTIVE: Explain how economists use models to analyze economic events and government policies.

Economic model A simplified version of reality used to analyze real-world economic situations.

As mentioned at the start of the chapter, **economic models** are simplified versions of reality used to analyze real-world economic situations. (This book uses the words *model* and *theory* interchangeably.) Many professions rely on models. Today, most models are mathematical and are analyzed using computer programs. For example:

- An engineer may use a computer model of a bridge to help test whether it will withstand high winds.
- A biologist may use a computer model of a nucleic acid to better understand its properties.

Economists rely on models, or theories, to analyze real-world issues ranging from the effects of tariffs on the prices of imported goods to the most efficient policies for reducing pollution. One purpose of economic models is to make economic ideas sufficiently explicit and concrete so that individuals, firms, or the government can use them to make decisions. For example, we will see in Chapter 3 that the model of demand and supply is a simplified version of how the prices of products are determined by the interactions among buyers and sellers in markets.

Economists use economic models to answer questions such as "How many people will be employed in manufacturing in 2031?" Economists at the U.S. Bureau of Labor Statistics (BLS) build models that allow them to forecast future employment in different occupations. The BLS models provide estimates of future demand for U.S. manufacturing production and estimates of how many employees manufacturing firms will require to produce that level of output. As mentioned at the beginning of the chapter, the BLS forecasts that employment in manufacturing will decline by 2031.

Sometimes economists use an existing model to analyze a real-world problem or issue, but in other cases, they have to develop a new model. To develop a model, economists generally follow these steps:

1. Decide on the assumptions to use.
2. Formulate a testable hypothesis.
3. Use economic data to test the hypothesis.
4. Revise the model if it fails to explain the economic data well.
5. Retain the revised model to help answer similar economic questions in the future.

The Role of Assumptions in Economic Models

Any model is based on assumptions because models have to be simplified to be useful. Economic models make *behavioral assumptions* about the motives of consumers and firms. Economists assume that consumers will buy the goods and services that will maximize their well-being or their satisfaction. Similarly, economists assume that firms act to maximize their profits. These assumptions are simplifications because they do not describe the motives of every consumer and every firm. How can we know whether the assumptions in a model are too simplified or too limiting? We can determine the usefulness of assumptions by forming hypotheses based on the assumptions and then testing the hypotheses using real-world information.

Forming and Testing Hypotheses in Economic Models

Economic variable Something measurable that can have different values, such as the number of people employed in manufacturing.

An **economic variable** is something measurable that can have different values, such as the number of people employed in manufacturing. In an economic model, a hypothesis is a statement about an economic variable that may be either correct or incorrect. An example of a hypothesis in an economic model is the statement that increased use of industrial robots and information technology in U.S. factories has caused a decline in manufacturing employment. The hypothesis may be correct if the main effect of industrial robots has been to replace assembly line workers, thereby reducing employment. Or the hypothesis may be incorrect if the use of robots and other information technology has increased firms' demand for software programmers and other technology workers, thereby increasing employment. An economic hypothesis is usually about a *causal relationship*; in this case, the hypothesis states that increased use of robots and information technology has caused, or led to, lower employment in manufacturing.

Before we can accept a hypothesis, we have to test it by analyzing statistics, or data, on the relevant economic variables. In our example, we could gather (1) data on how the use of industrial robots and information technology in manufacturing has changed over time and (2) data on changes in employment in manufacturing. Testing a hypothesis can be tricky. For example, showing that employment in manufacturing declined at the same time that the use of robots increased would not be enough to demonstrate that the increased use of robots *caused* the decline in employment. Just because two things are *correlated*—that is, they happen at the same time—does not mean that one causes the other.

For example, suppose that at the same time that the use of robots in U.S. manufacturing was increasing, U.S. manufacturing firms faced declining sales due to increased competition from foreign firms. In that case, the declining sales, rather than the increased use of robots, might explain the decrease in U.S. manufacturing employment. Distinguishing between correlation and causality when analyzing economic relationships is a key task of economic analysis. An additional complication in economic analysis is that over a period of time, the values of many economic variables change, which makes it more difficult to test hypotheses focused on just two of those variables. Because evaluating a hypothesis is usually not straightforward, when economists disagree about a hypothesis, it is often because they disagree on how to interpret the statistical analysis used to test the hypothesis.

Note that hypotheses must be statements that could, in principle, turn out to be incorrect. Statements such as "Increasing employment in manufacturing is good" or "Increasing employment in manufacturing is bad" are value judgments rather than hypotheses because it is not possible to disprove them.

Economists accept and use an economic model if it leads to hypotheses that are confirmed by statistical analysis. In many cases, the acceptance is tentative, however, pending the gathering of new data or further statistical analysis. In fact, economists often label a hypothesis as "not rejected" rather than as "accepted" by statistical analysis. But what if statistical analysis clearly rejects a hypothesis? For example, what if a model leads to a hypothesis that increased use of industrial robots will cause a decline in manufacturing employment, but the data reject this hypothesis? In this case, the model should be reconsidered. It may be that an assumption used in the model was too simplified or too limiting. For example, perhaps the model ignored the fact that the mix of products being manufactured in the United States was changing. The assembly of electric cars might require more workers than does the assembly of gasoline-powered cars. Or perhaps the model did not include the effect of tariffs on the demand for U.S. manufactured goods because such tariffs had previously been lower. If tariffs sharply increase, the model may not be able to accurately estimate the relationship between changes in the use of industrial robots and changes in employment.

As we saw at the beginning of the chapter, the BLS has forecast that total employment in U.S. manufacturing will decline from 13.0 million in August 2023 to 12.2 million in 2031. The BLS periodically analyzes the accuracy of its projections. It has had difficulty accurately projecting manufacturing employment. For example, in 2000, the BLS projected that in 2010, 19,047,000 people would be employed in manufacturing. In fact, in 2010, only 11,529,000 people were employed in manufacturing. The BLS concluded that this large error was the result of its model failing to account for the extent to which U.S. firms would move manufacturing operations overseas, how quickly firms would improve their ability to produce the same output with fewer workers, and the lasting effects of the severe 2007–2009 recession. Analyzing its errors helps the BLS improve its models and employment projections.

The process of developing models, testing hypotheses, and revising models occurs not just in economics but also in disciplines such as physics, chemistry, and biology. This process is often called the *scientific method*. Economics is a *social science* because it applies the scientific method to the study of interactions among individuals.

Positive and Normative Analysis

Throughout this book, as we build economic models and use them to answer questions, bear in mind the following important distinction:

Positive analysis Analysis concerned with what is.

Normative analysis Analysis concerned with what ought to be.

1. **Positive analysis** is concerned with *what is.*
2. **Normative analysis** is concerned with *what ought to be.*

Economics is about positive analysis, which measures the costs and benefits of different courses of action.

We can use the federal government's minimum wage law to compare positive and normative analysis. In June 2023, under this law, it was illegal for an employer to hire a worker at a wage less than $7.25 per hour. (Some states and cities had enacted higher minimum wages.) Without the minimum wage law, some firms and workers would voluntarily agree to a lower wage. Because of the minimum wage law, some workers have difficulty finding jobs, and some firms end up paying more for labor than they otherwise would. A positive analysis of the federal minimum wage law uses an economic model to estimate how many workers have lost their jobs because of the law, its effect on the costs and profits of businesses, and the gains to workers receiving the minimum wage. After economists complete this positive analysis, the decision as to whether the minimum wage law is a good or a bad idea is a normative one and depends on how people evaluate the trade-off involved. Supporters of the law believe that the losses to employers and workers who are unemployed as a result of the law are more than offset by the gains to workers who receive higher wages than they would without the law. Opponents of the law believe the losses to be greater than the gains. The assessment by any individual depends, in part, on that person's values and political views. The positive analysis an economist provides would play a role in the decision but can't by itself decide the issue one way or the other.

In each chapter, you will see a *Don't Let This Happen to You* box like the one below. These boxes alert you to common pitfalls in thinking about economic ideas.

Don't Let This Happen to You

Don't Confuse Positive Analysis with Normative Analysis

"Economic analysis has shown that the minimum wage law is a bad idea because it causes unemployment." Is this statement accurate? In 2023, the federal minimum wage law prevented employers from hiring workers at a wage of less than $7.25 per hour. This wage is higher than some employers are willing to pay some workers. If there were no minimum wage law, some workers who currently cannot find any firm willing to hire them at $7.25 per hour would be able to find employment at a lower wage. Therefore, positive economic analysis indicates that the minimum wage law causes unemployment. (In Chapter 4, we'll explore why economists disagree about *how much* unemployment the minimum wage law causes.) But some workers who have jobs benefit from the minimum wage law because they are paid a higher wage than they otherwise would be paid. In other words, the minimum wage law creates both losers—the workers who become unemployed and the firms that have to pay higher wages—and winners—the workers who receive higher wages.

Should we value the gains to the winners more than we value the losses to the losers? The answer involves normative analysis. Positive economic analysis can show the consequences of a particular policy, but it cannot tell us whether the policy is "good" or "bad." So, the statement at the beginning of this box is inaccurate.

Your Turn: Test your understanding by doing related problems 3.6, 3.7, and 3.8 at the end of this chapter.

Economics as a Social Science

Because economics studies the actions of individuals, it is a social science, as are psychology, political science, and sociology. Economics differs from other social sciences in that it puts more emphasis on how the decisions of *individuals* explain outcomes such as the prices firms charge or the policies governments enact. Economics considers individual decision making in every context, not just in the context of business. Economists have studied issues such as why people have difficulty attaining goals such as losing weight, why people sometimes ignore relevant information when making decisions, and how couples decide to divide up household chores. Government policymakers have also increasingly relied on economic analysis when evaluating laws or regulations. As we will see throughout this book, economists have played an important role in influencing government policies in areas such as the environment, health care, and efforts to reduce poverty.

Apply the Concept

What Can Economics Contribute to the Debate over Tariffs?

We saw in the chapter opener that during President Trump's time in office, his administration tried to increase manufacturing employment by enacting tariffs on imported goods. President Biden continued many of these tariffs. What effect do tariffs on imports of goods from China and other countries have on the U.S. economy? Governments typically impose tariffs to raise revenue or to discourage imports by raising the selling prices of imported goods. If imports of goods decline, production and employment at domestic firms that compete with imports may increase. For example, a tariff on imports of furniture from China would raise the prices of imported furniture and lead U.S. consumers to buy more furniture manufactured in the United States. We can create a preliminary list of potential winners and losers in a country that imposes a tariff: The government gains from collecting the tariff revenue, and some domestic firms and their workers gain from the higher prices of competing imported goods. Consumers lose because they pay higher prices for goods on which the tariff has been enacted. If some of the imported goods are used as inputs or are sold by domestic firms—for example, Walmart may sell furniture imported from China—those firms will also lose from the tariff.

Economics can provide valuable information to policymakers and the general public as they consider actions such as implementing tariffs. As we will discuss further in Chapters 2 and 9, economic analysis shows that trade between countries occurs primarily on the basis of comparative advantage. A country has a comparative advantage if it can produce a good at a lower opportunity cost than competitors. For example, due to the climate and soil in Colombia, coffee can be grown there without requiring the transfer of significant resources from producing other goods and services—so the opportunity cost of producing coffee in Colombia is low. The United States is not well suited for producing coffee, so the opportunity cost of producing coffee in the United States is very high. We can conclude that Colombia has a comparative advantage relative to the United States in producing coffee. Imposing a high tariff on imports to the United States of Colombian coffee would reduce economic efficiency by shifting production of coffee from Colombia, where it can be grown at a low cost, to the United States, where it can only be grown at a high cost.

Jess Kraft/Shutterstock

Because of its fertile soil and warm climate, Colombia has a comparative advantage in coffee bean production relative to the United States.

Economists can use models to estimate the dollar amounts gained by the winners from the imposition of a tariff, the amount lost by the losers, and the size of the loss of economic efficiency. Economic analysis of tariffs typically shows that the dollar losses from the government imposing a tariff are larger than the dollar gains, so the tariff causes a net loss for the country as a whole.

Although economic analysis can contribute to the debate over policy proposals by measuring their likely effects, it cannot by itself decide whether a proposal should be enacted. Policymakers and a majority of the general public may decide to support a tariff because they place a higher value on the gains to some groups—workers and firms struggling to compete against imported goods—than on the losses to other groups—consumers as a whole. In other words, policymakers and the general public would be making a normative judgment in favor of tariffs. Ultimately policymakers and the general public are responsible for weighing trade-offs and deciding whether a proposed policy should be enacted.

Your Turn: Test your understanding by doing related problem 3.9 at the end of this chapter.

1.4 Microeconomics and Macroeconomics

LEARNING OBJECTIVE: Distinguish between microeconomics and macroeconomics.

Microeconomics The study of how households and firms make choices, how they interact in markets, and how the government attempts to influence their choices.

Macroeconomics The study of the economy as a whole, including topics such as inflation, unemployment, and economic growth.

Economic models can be used to analyze decision making in many areas. We group some of these areas together as *microeconomics* and others as *macroeconomics*. **Microeconomics** is the study of how households and firms make choices, how they interact in markets, and how the government attempts to influence their choices. **Macroeconomics** is the study of the economy as a whole, including topics such as inflation, unemployment, and economic growth. Table 1.1 gives examples of microeconomic and macroeconomic issues.

The division between microeconomics and macroeconomics is not a bright line. Many economic situations have *both* a microeconomic aspect and a macroeconomic aspect. For example, the level of total investment by firms in new machinery and equipment helps

Table 1.1

Issues in Microeconomics and Macroeconomics

Examples of Microeconomic Issues	Examples of Macroeconomic Issues
• How consumers react to changes in product prices • How firms decide what prices to charge for the products they sell • Which government policy would most efficiently reduce opioid addiction • The effect of artificial intelligence (AI) on firms' costs of production and on employment in some industries • The most efficient way to reduce air pollution	• Why economies experience periods of recession and increasing unemployment • Why, over the long run, some economies have grown much faster than others • What determines the inflation rate • What determines the value of the U.S. dollar in exchange for other currencies • Whether government intervention can reduce the severity of recessions

determine how rapidly the economy grows—which is a macroeconomic issue. But to understand how much new machinery and equipment firms decide to purchase, we have to analyze the incentives individual firms face—which is a microeconomic issue.

1.5 Economic Skills and Economics as a Career

LEARNING OBJECTIVE: Describe economics as a career and the key skills you can gain from studying economics.

How do economists do what they do? The following analogy may be helpful: When people are thinking of buying a house, they may hire a structural engineer as a consultant to examine the house and prepare a report. That report is likely to both *describe* any problems with the house—like cracks in the foundation—and *advise* the potential buyer how to fix the problems and the likely cost.

You have seen that economics is about making choices. Economists spend much of their time describing how individuals, businesses, and governments make choices and analyzing the results of the choices. Then, like a structural engineer advising a homeowner how to fix a leaky basement, economists advise on how better decisions can be made.

In this book, we will see the many situations in which everyone can apply economic principles. For example:

- *Individuals* can use economic principles to improve how they make important decisions, such as what career to pursue, what financial investment to make, or whether to lease or buy a car. Economic principles are also useful in understanding policy debates such as those on the minimum wage, tariffs, and environmental policy. Mastering the principles of economics provides you with practical skills no matter what subject you end up majoring in.
- *Managers* in businesses can use economic principles to improve how they make important decisions, such as what prices to charge for their products, whether to begin selling their products in a foreign market, or whether to invest in new software.
- *Government policymakers* can use economic principles to make decisions such as whether to raise taxes on cigarettes to discourage teenage smoking, whether to raise interest rates to reduce the threat of inflation, and whether to allocate additional funds to research on cancer or to research on ways to reduce opioid addiction.

Many of the choices we discuss in this book will be those that businesses make. Economists have developed a set of tools designed specifically to help businesses make better decisions. It is not too surprising that more CEOs of large corporations majored in economics than in any other subject. Examples include:

- Elon Musk of Tesla, SpaceX, X (formerly Twitter), and the Boring Company
- Meg Whitman, formerly CEO of Hewlett-Packard
- Warren Buffett of Berkshire Hathaway

Table 1.2

Applying Economics in a Career

Company or Organization	What an Economist at the Company Might Do
Ford Motor Company	Forecast the demand for electric cars over the next 10 years.
Goldman Sachs, a Wall Street investment firm	Use economic models to forecast future values of interest rates.
McDonald's	Determine whether the firm should open additional restaurants in China.
Pfizer, a pharmaceutical company	Analyze the financial cost and benefits of a new treatment for cancer.
Wall Street Journal	Report on the Federal Reserve and interpret monetary policy for the paper's readers.
A college or university	Teach economics and conduct research on economic issues.
A regional Federal Reserve Bank	Forecast trends in employment and production in that region.
U.S. Federal Trade Commission	Gather and analyze data on whether two firms should be allowed to reduce competition in a market by merging to form a combined firm, as when supermarket chains Kroger and Albertsons announced in 2022 that they were merging.
The World Bank, an international economic organization with the mission of reducing poverty and increasing economic growth	Write a report analyzing the effectiveness of a development program in a low-income country.

Many businesses, government agencies, and nonprofit organizations—including hospitals, museums, and charities—hire economists. Colleges and universities also hire economists to teach and to conduct academic research on business, the economy, and economic policy. A first step for many students in deciding whether to pursue a career in economics is to seek a summer internship with a firm or an agency that employs economists.

The Bureau of Labor Statistics website (www.bls.gov) lists activities economists often perform while pursuing careers in different organizations. We summarize some of these activities in Table 1.2. To learn more, visit the BLS website and search for "Occupational Outlook Handbook."

Does Majoring in Economics Increase Your Income?

Regardless of your major, studying economics will provide you with useful tools to make personal decisions, understand how business managers make decisions, and evaluate government policies. Majoring in economics can lead to a career in business or government or at nonprofit organizations. Let's compare the incomes of economics majors with the incomes of other majors.

The Federal Reserve Bank of New York maintains a web page that uses data collected by the U.S. Census Bureau to show the incomes of people with different college majors. Table 1.3 shows for 2022 the median annual wage people received early in their careers (ages 22 to 27) and in the middle of their careers (ages 35 to 45). The median is a measure of the average calculated as the annual wage at which half of people in the group have a higher annual wage and half have a lower annual wage. The data are for people with a bachelor's degree only—people with a master's or doctoral degree are not included.

The table shows that early in their careers, economics majors on average earn an annual wage about 33 percent higher than the annual wage earned by all majors. At midcareer, the gap decreases somewhat, to 26 percent.

How should we interpret these data? In Section 1.3, we made the important distinction between *correlation* and *causality*. Just because two events or changes in the values of

	Median Wage Early Career (people aged 22 to 27)	Median Wage Midcareer (people aged 35 to 45)
Economics majors	$60,000	$91,000
All majors	$45,000	$72,000

Table 1.3

Higher Salaries for Economics Majors: Correlation or Causation?

two variables are correlated, or happen at the same time, doesn't mean that one caused the other. In this case:

- Are the higher-than-average incomes of economics majors *caused* by majoring in economics?
  Or
- Is majoring in economics *correlated* with higher incomes but not actually causing the higher incomes?

It might be true, for instance, that economics majors are on average more likely to have certain characteristics—such as being more intelligent, being more comfortable with quantitative methods, or being harder workers—than are students who choose other majors. Because those characteristics can lead to successful careers, students majoring in economics might have earned higher incomes on average even if they had chosen different majors.

Here's a more advanced point about detecting causal relationships in data: The problem with determining causality described in the previous paragraph is called *selection bias*. Students aren't randomly assigned majors; they choose, or *self-select*, majors. If students with characteristics that make it more likely that they will earn high incomes are also more likely to choose to major in economics, then the higher incomes earned by economics majors weren't necessarily caused by majoring in economics.

Economists Zachary Bleemer of the University of California, Berkeley and Aashish Mehta of the University of California, Santa Barbara found a way to evaluate whether majoring in economics causes students to earn higher incomes. The authors gathered data on all the students admitted to the University of California, Santa Cruz (UCSC) between 2008 and 2012 and data on the incomes of those individuals in 2017 and 2018. To major in economics, students at UCSC needed a grade point average (GPA) of 2.8 or higher in the two principles of economics courses. The authors compared the choices of majors and the average early career earnings of students who just met or just failed to meet the 2.8 GPA threshold for majoring in economics. The authors used advanced statistical analysis to reach this conclusion: "Comparing the major choices and average wages of above-and-below-threshold students shows that majoring in economics caused a $22,000 (46 percent) increase in annual early-career wages of barely above-threshold students."

The authors attributed half of the higher wages earned by economics majors to their being more likely to pursue careers in finance, insurance, real estate, and accounting, which tend to pay above-average wages. The authors noted that their findings from this study "imply that students' major choices could have financial implications roughly as large as their decision to enroll in college."

1.6 A Preview of Important Economic Terms

LEARNING OBJECTIVE: Define important economic terms.

In the following chapters, you will encounter certain important terms again and again. Becoming familiar with these terms is a necessary step in learning economics. Here we provide a brief introduction to some of these terms. We will discuss them all in greater depth in later chapters:

- ***Firm, company, or business*:** A *firm* is an organization that produces a good or service. Most firms produce goods or services to earn a profit, but there are also nonprofit firms, such as universities and some hospitals. Economists use the terms *firm*, *company*, and *business* interchangeably.

- ***Entrepreneur*:** An *entrepreneur* is someone who operates a business. In a market system, entrepreneurs decide what goods and services to produce and how to produce them. An entrepreneur starting a new business puts his or her own funds at risk. An entrepreneur who is wrong about what consumers want or about the best way to produce goods and services may lose his or her funds. Losing money in a failed business is not unusual: In the United States, about half of new businesses fail within four years. Without entrepreneurs willing to assume the risk of starting and operating businesses, economic progress would be impossible in a market system.
- ***Innovation*:** There is a distinction between an *invention* and an *innovation*. An *invention* is a new good or a new process for making a good. An *innovation* is the practical application of an invention. (*Innovation* may also be used more broadly to refer to any significant improvement in a good or in the means of producing a good.) Much time often passes between the appearance of a new idea and its development for widespread use. For example, the Wright brothers first achieved self-propelled flight at Kitty Hawk, North Carolina, in 1903, but the Wright brothers' plane was very crude, and it was not until the introduction of the DC-3 by Douglas Aircraft in 1936 that regularly scheduled intercity airline flights became common in the United States. Similarly, the first digital electronic computer—the ENIAC—was developed in 1945, but the first IBM personal computer was not introduced until 1981, and widespread use of computers did not have a significant effect on the productivity of U.S. businesses until the 1990s.
- ***Technology*:** A firm's *technology* is the processes it uses to produce goods and services. In the economic sense, a firm's technology depends on many factors, such as the skill of its managers, the training of its workers, and the speed and efficiency of its machinery and equipment.
- ***Goods*:** *Goods* are tangible merchandise, such as books, computers, or smartphones.
- ***Services*:** *Services* are activities performed for others, such as providing haircuts or investment advice.
- ***Revenue*:** A firm's *revenue* is the total amount received for selling a good or service. We calculate it by multiplying the price per unit by the number of units sold.
- ***Profit*:** A firm's *profit* is the difference between its revenue and its costs. Economists distinguish between *accounting profit* and *economic profit*. In calculating accounting profit, we exclude the costs of some economic resources that the firm does not pay for explicitly. In calculating economic profit, we include the opportunity costs of all resources used by the firm. When we refer to *profit* in this book, we mean economic profit. It is important not to confuse *profit* with *revenue*.
- ***Household*:** A *household* consists of all persons occupying a home. Households are suppliers of factors of production—particularly labor—used by firms to make goods and services. Households also demand goods and services produced by firms and governments.
- ***Factors of production, economic resources,* or *inputs*:** Firms use *factors of production* to produce goods and services. The main factors of production are labor, capital, natural resources—including land—and entrepreneurial ability. Households earn income by supplying the factors of production to firms. Economists use the terms *factors of production*, *economic resources*, and *inputs* interchangeably.
- ***Capital*:** In everyday speech, the word *capital* can refer to *financial capital* or to *physical capital*. Financial capital includes stocks and bonds issued by firms, bank accounts, and holdings of money. In economics, though, *capital* refers to physical capital, which includes manufactured goods that are used to produce other goods and services. Examples of physical capital are computers, factory buildings, machine tools, warehouses, and trucks. The total amount of physical capital available in a country is called its *capital stock*.
- ***Human capital*:** *Human capital* refers to the accumulated training and skills that workers possess. For example, college-educated workers generally have more skills and are more productive than workers who have only high school diplomas; therefore, college-educated workers have more human capital.

Continued from chapter opener

Economics in Your Life & Career

Should You Consider a Career in Manufacturing?

At the beginning of this chapter, we posed the question "What is the basis of the BLS's forecast of manufacturing employment, and how reliable is it?" As we saw in this chapter, the BLS uses economic models to forecast future employment in U.S. manufacturing. The BLS has had difficulty accurately forecasting manufacturing employment. For example, in 2000, the BLS forecast that manufacturing employment would increase over the following 10 years, when in fact it declined substantially. The BLS analyzes errors like these in attempting to improve its forecasts. So, it is likely that the BLS's forecasts will become more accurate over time, but it would be a mistake to expect the forecasts to be exact.

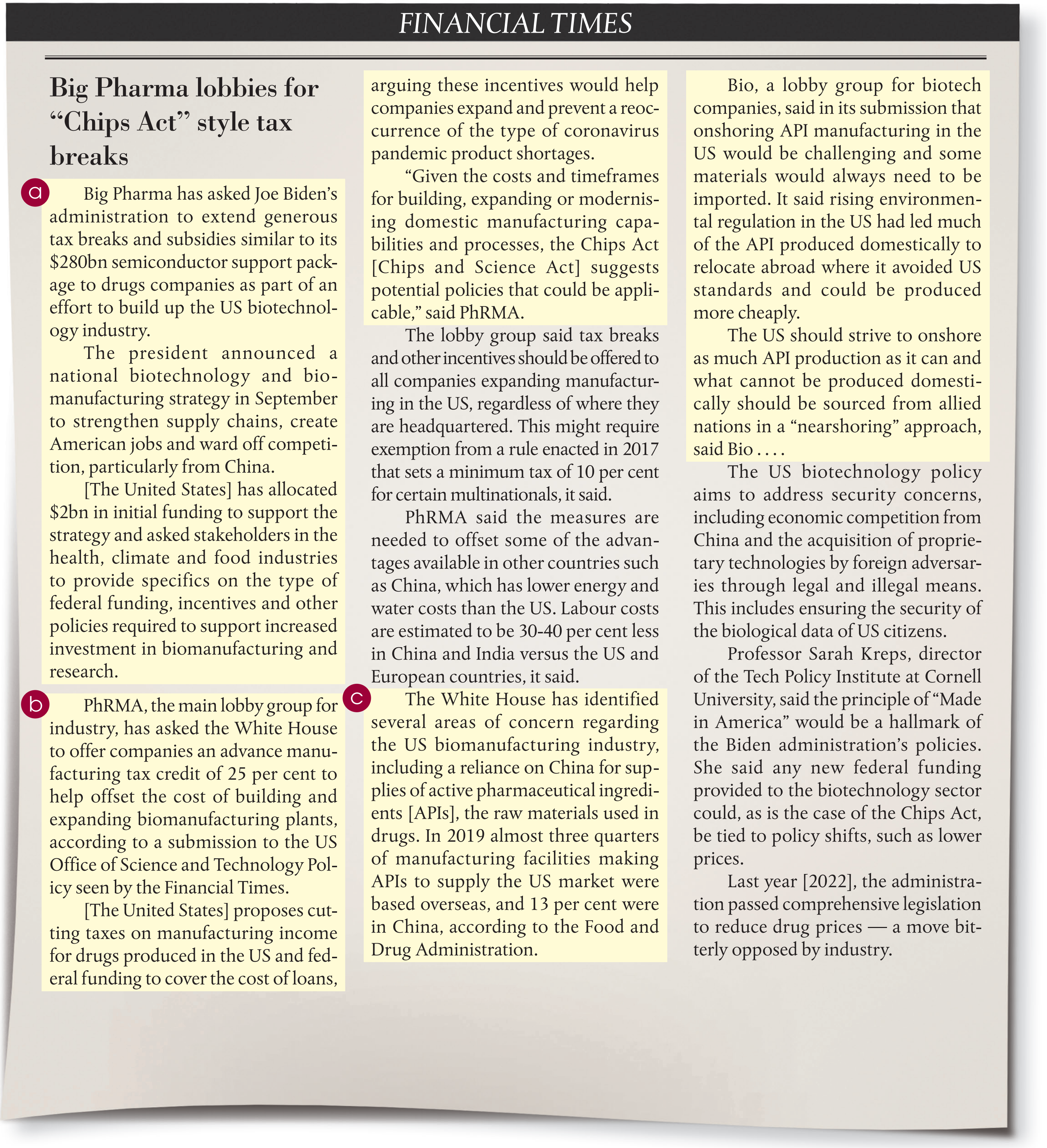
Conclusion

Economics is a group of useful ideas about how individuals make choices, given their scarce resources. Economists have put these ideas into practice by developing economic models. Consumers, business managers, and government policymakers use these models every day to help make choices. In this book, we explore many key economic models and give examples of how to apply them in the real world.

Reading the news is an important part of understanding the current state of the economy. It can also help you learn how to apply economic concepts to a variety of real-world events. At the end of each of the first four chapters, you will see a two-page feature titled *An Inside Look*. This feature consists of an excerpt from an article that relates to the company or economic issue introduced at the start of the chapter and also to the concepts discussed in the chapter. A summary and an analysis with a supporting table or graph highlight the key economic points of the article.

AN **INSIDE** LOOK

Will Biden's Strategy Expand the U.S. Biotechnology Industry?



FINANCIAL TIMES

Big Pharma lobbies for "Chips Act" style tax breaks

ⓐ Big Pharma has asked Joe Biden's administration to extend generous tax breaks and subsidies similar to its $280bn semiconductor support package to drugs companies as part of an effort to build up the US biotechnology industry.

The president announced a national biotechnology and biomanufacturing strategy in September to strengthen supply chains, create American jobs and ward off competition, particularly from China.

[The United States] has allocated $2bn in initial funding to support the strategy and asked stakeholders in the health, climate and food industries to provide specifics on the type of federal funding, incentives and other policies required to support increased investment in biomanufacturing and research.

ⓑ PhRMA, the main lobby group for industry, has asked the White House to offer companies an advance manufacturing tax credit of 25 per cent to help offset the cost of building and expanding biomanufacturing plants, according to a submission to the US Office of Science and Technology Policy seen by the Financial Times.

[The United States] proposes cutting taxes on manufacturing income for drugs produced in the US and federal funding to cover the cost of loans, arguing these incentives would help companies expand and prevent a reoccurrence of the type of coronavirus pandemic product shortages.

"Given the costs and timeframes for building, expanding or modernising domestic manufacturing capabilities and processes, the Chips Act [Chips and Science Act] suggests potential policies that could be applicable," said PhRMA.

The lobby group said tax breaks and other incentives should be offered to all companies expanding manufacturing in the US, regardless of where they are headquartered. This might require exemption from a rule enacted in 2017 that sets a minimum tax of 10 per cent for certain multinationals, it said.

PhRMA said the measures are needed to offset some of the advantages available in other countries such as China, which has lower energy and water costs than the US. Labour costs are estimated to be 30-40 per cent less in China and India versus the US and European countries, it said.

ⓒ The White House has identified several areas of concern regarding the US biomanufacturing industry, including a reliance on China for supplies of active pharmaceutical ingredients [APIs], the raw materials used in drugs. In 2019 almost three quarters of manufacturing facilities making APIs to supply the US market were based overseas, and 13 per cent were in China, according to the Food and Drug Administration.

Bio, a lobby group for biotech companies, said in its submission that onshoring API manufacturing in the US would be challenging and some materials would always need to be imported. It said rising environmental regulation in the US had led much of the API produced domestically to relocate abroad where it avoided US standards and could be produced more cheaply.

The US should strive to onshore as much API production as it can and what cannot be produced domestically should be sourced from allied nations in a "nearshoring" approach, said Bio . . . .

The US biotechnology policy aims to address security concerns, including economic competition from China and the acquisition of proprietary technologies by foreign adversaries through legal and illegal means. This includes ensuring the security of the biological data of US citizens.

Professor Sarah Kreps, director of the Tech Policy Institute at Cornell University, said the principle of "Made in America" would be a hallmark of the Biden administration's policies. She said any new federal funding provided to the biotechnology sector could, as is the case of the Chips Act, be tied to policy shifts, such as lower prices.

Last year [2022], the administration passed comprehensive legislation to reduce drug prices — a move bitterly opposed by industry.

Key Points in the Article

As part of an effort to expand the U.S. biotechnology industry, lobbyists for the industry have asked the Biden administration for tax breaks and subsidies similar to those granted to semiconductor manufacturers through the Chips and Science Act of 2022. The primary lobby group for companies in the U.S. pharmaceutical industry has requested tax credits, tax cuts, and federal funding for companies in the industry. The lobby group has stated that these incentives are needed to help counter advantages that firms have in countries such as China and India, where energy and labor costs are significantly lower than in the United States. In September 2022, President Biden announced a strategy to strengthen supply chains, create jobs, and impede foreign competition in the biotechnology industry. His administration identified domestic reliance on foreign countries for the raw materials used to manufacture pharmaceuticals as one of several concerns.

Analyzing the News

ⓐ Part of the Biden administration's strategy to increase employment and expand manufacturing in the domestic biotechnology and biomanufacturing industries is for industry leaders to provide specifics on the federal funding, policies, and incentives needed to support manufacturing and research. One key economic idea is that people respond to economic incentives. Leaders in the pharmaceutical industry have asked for tax breaks and subsidies for U.S. drug manufacturers to both assist in domestic expansion and help compete with foreign producers. These tax breaks and subsidies are examples of economic incentives because they are designed to encourage pharmaceutical manufacturers to expand domestic production through growth and *reshoring*—bringing production back to the United States.

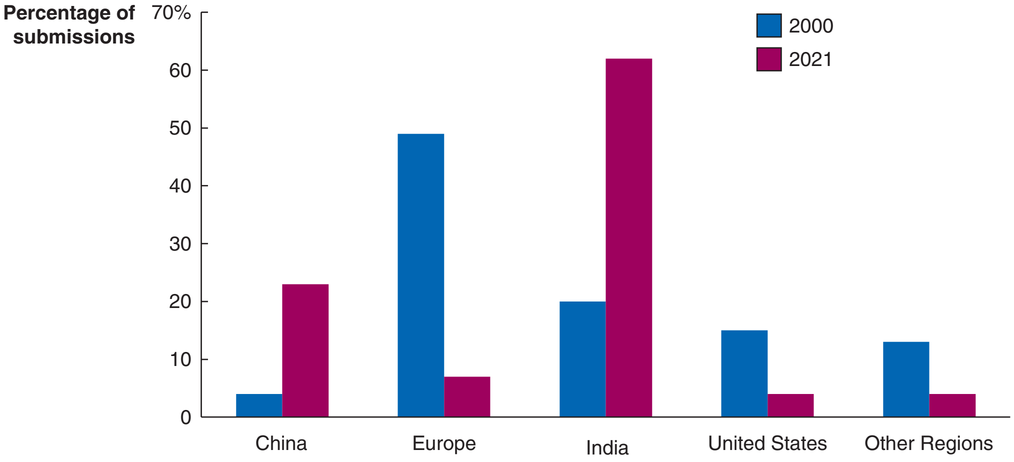
ⓑ The Pharmaceuticals and Research Manufacturers of America, or PhRMA, is the primary lobbying group for the U.S. biotechnology industry. PhRMA requested the following changes, asserting that these incentives would promote domestic expansion as well as prevent product shortages: (1) 25 percent tax credits for companies to build and expand manufacturing facilities; (2) tax cuts on manufacturing income for U.S.-produced pharmaceuticals; and (3) federal funding to cover loan costs.

Another key economic idea is that people are rational, and economists assume that consumers and firms use all available information as they act to achieve their goals. Pharmaceutical manufacturers would be acting rationally if they chose to respond to these tax-credit and tax-cut incentives to expand production if they believed these incentives would result in the most cost-effective way to make their products.

ⓒ Active pharmaceutical ingredients, or APIs, are the raw materials used in drug manufacturing. U.S. drug producers rely heavily on foreign-supplied APIs, and since 2000, that reliance has grown. The figure below shows the percentage of API drug master files filed in 2000 and 2021, by country or region of manufacture. (Pharmaceutical companies submit drug master files to the FDA with detailed information about their facilities.) The percentage has decreased from 15 percent to 4 percent in the United States, while the percentage has increased from 24 to 85 percent in China and India combined. Lobby group Bio believes increased U.S. environmental regulation has caused U.S. companies to relocate to other countries, where they can produce APIs at a lower cost. These changes in where APIs are produced also reflect the key economic idea that people respond to economic incentives. Higher costs resulting from environmental regulation incentivized companies to move production to countries with lower production costs.

Thinking Critically

1. In 2022, the Biden administration allocated $2 billion in initial funding to support a national biotechnology and biomanufacturing strategy, in part to create U.S. jobs and to reduce competition from China. Explain how this funding can provide an incentive for companies to return pharmaceutical manufacturing jobs from China back to the United States.
2. Evaluate the following statement and use the concepts of positive and normative analysis to explain whether you agree with it: "The figure shows that from 2000 to 2021, the percentage of API drug master files decreased by more than 50 percent in the United States while more than tripling in India and China combined. This timeline coincides with an increase in U.S. environmental regulations that resulted in much of the domestically produced API relocating abroad. This figure supports these three points: (1) Environmental regulations were primarily responsible for the decline in U.S. API manufacturing; (2) implementing these regulations was ill advised; and (3) these regulations should be eliminated to return API manufacturing from China and India to the United States."



API Drug Master Files, by Year of Filing and Country or Region of Manufacture

Pharmaceutical companies prepare API drug master files, which are submissions made to the U.S. Food and Drug Administration (FDA) that provide information on the ingredients used to manufacture human drugs.
Source: U.S. Pharmacopeia Medicine Supply Map.

CHAPTER SUMMARY AND PROBLEMS

Key Terms

Allocative efficiency, p. 11
Centrally planned economy, p. 10
Economic model, p. 12
Economic variable, p. 13
Economics, p. 4
Equity, p. 12
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Positive analysis, p. 14
Productive efficiency, p. 11
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Trade-off, p. 9
Voluntary exchange, p. 11

1.1 Three Key Economic Ideas

LEARNING OBJECTIVE: Explain these three key economic ideas: People are rational, people respond to economic incentives, and optimal decisions are made at the margin.

Summary

Economics is the study of the choices consumers, business managers, and government officials make to attain their goals, given their scarce resources. We must make choices because of **scarcity**, which means that although our wants are unlimited, the resources available to fulfill those wants are limited. A **market** is a group of buyers and sellers who trade a good or service. Economists assume that people are rational in the sense that consumers and firms use all available information as they take actions intended to achieve their goals. Rational individuals weigh the benefits and costs of each action and choose an action only if the benefits outweigh the costs. Although people act from a variety of motives, ample evidence indicates that they respond to economic incentives. Economists use the word *marginal* to mean extra or additional. **Marginal analysis** involves comparing marginal benefits and marginal costs. The optimal decision is to continue any activity up to the point where the marginal benefit equals the marginal cost ($MB = MC$).

Review Questions

1.1 Briefly discuss the meaning of each of the following economic ideas: People are rational, people respond to economic incentives, and optimal decisions are made at the margin.

1.2 What is scarcity? Why is scarcity central to the study of economics?

Problems and Applications

1.3 Discuss whether you agree with the following statement: "The problem with economics is that it assumes that consumers and firms always make the correct decisions. But we know that everyone makes mistakes."

1.4 According to the FBI Bank Crime Statistics, there were 1,964 bank robberies in the United States in 2021. The FBI argues that banks have made themselves easy targets by refusing to install clear acrylic partitions, called *bandit barriers*, that separate bank tellers from the public. According to a special agent with the FBI, "Bandit barriers are a great deterrent. We've talked to guys who rob banks, and as soon as they see a bandit barrier, they go find another bank." Despite this finding, many banks have been reluctant to install these barriers. What information would you need to determine whether banks have an economic incentive to install bandit barriers?

1.5 The grading system plays an important role in student learning. In their book *Effective Grading: A Tool for Learning and Assessment in College*, Barbara Walvoord and Virginia Anderson stated that "grading infuses everything that happens in the classroom." They also argued that grading "needs to be acknowledged and managed from the first moment that an instructor begins planning a class."

- **a.** How could the grading system an instructor uses affect the incentives of students to learn the course material?
- **b.** If instructors put too little weight in the grading scale on a certain part of the course, such as readings outside the textbook, how might students respond?
- **c.** Instructors often wish that students came to class prepared, having read the material to be covered that day. How could instructors design their grading systems to motivate students to come to class prepared?

1.6 An article in the *Economist* magazine had the headline, "Trade in Dinosaur Fossils Is Good for Science." The article notes that: "Scientists often lack the resources to find, collect and preserve every fossil with scientific value before it is destroyed by nature. The private sector plugs the gap by responding to price signals." According to the article, in the United States any dinosaur fossils discovered are the property of the landowner. In many other countries, any dinosaur fossils discovered become the property of the government.

- **a.** What does the article mean by the "private sector"? What gaps is the private sector "plugging"?
- **b.** Would you expect more dinosaur fossils to be discovered in the United States or in a country where the fossil would become the property of the government? Briefly explain.
- **c.** Are there any reasons why allowing people to buy and sell dinosaur fossils might be *bad* for science? Briefly explain.

1.7 Suppose this semester you receive a grade of A in your chemistry class and a grade of C in your economics class. A friend comments: "It's clear you didn't learn the material in your economics class but you didn't rationally divide up your study time. If you had, you could have earned a B in both chemistry and economics." Is your friend correct? In your answer, be sure to explain what would need to be true for your friend to be correct and what would need to be true for your friend to be incorrect.

1.8 On February 24, 2022, Russian President Vladimir Putin launched a military invasion of Ukraine. He apparently expected to quickly achieve his main objectives, including occupying the Ukrainian capital of Kyiv and replacing the Ukrainian government. After three weeks, the fierce resistance of the Ukrainian armed forces prevented him from achieving these objectives. Although the Russian military had expected to experience few casualties or losses of equipment, in fact, the military personnel killed exceeded the number of U.S. military personnel killed since 2001 in the conflicts in Afghanistan and Iraq combined. Many Russian tanks and planes were also destroyed. The United States, the European Union, and other countries imposed economic sanctions on Russia that reduced the country's ability to import or export most goods, including oil and natural gas. The result of the sanctions was a reduction in the standard of living of the average Russian citizen. Most importantly, the war has killed thousands of Ukrainians and severely damaged many Ukrainian cities.

Using economic concepts, explain whether it was rational for Putin to persist in the invasion, or if he would have been acting rationally if instead he had withdrawn troops from Ukraine or accepted a political compromise. In your answer be sure to define what acting rationally means. (As of late 2023, the invasion continued, and there was no indication that a political compromise would occur.)

1.9 **[Related to the Apply the Concept "Will Changes to the Federal Student Loan Program Unintentionally Give Colleges an Incentive to Increase Tuition?"]** As we saw in this *Apply the Concept*, the federal government subsidizes some loans to college students. The more students who participate in these programs and the more they borrow, the higher the cost to the federal government. In 2011, President Barack Obama and Congress made these changes to the federal student loan programs: (1) Payments were capped at 10 percent of a borrower's discretionary income; (2) any unpaid balances for people working for government or in the nonprofit sector were forgiven after they made 120 monthly payments (10 years' worth of payments); and (3) people working in the private sector had their loans forgiven after they made 240 monthly payments (20 years of payments). [Note: As discussed in *Apply the Concept*, President Biden's changes to the federal student loan program altered these features.]

- **a.** As a result of the changes in the federal student loan programs, would you predict that the total amount that students borrowed under these programs increased or decreased? Briefly explain.
- **b.** As part of his 2016 federal budget proposal, President Obama recommended significant additional changes to the federal student loan programs. Given your answer to part (a), do you think President Obama was likely to have recommended changes that would increase or changes that would decrease the payments that borrowers would have to make? Briefly explain.
- **c.** Why might President Obama and his advisers have failed to correctly forecast the effects of the 2011 changes to the loan programs?

1.10 Many universities and corporations offer health and wellness programs that help their employees improve or maintain their health and get paid (a relatively small amount) for doing so. The programs vary but typically consist of employees completing a health assessment, receiving a program for healthy living, and monitoring their monthly health activities.

- **a.** Why would universities and corporations pay employees to improve or maintain their health?
- **b.** How does health insurance affect the incentive of employees to improve or maintain their health?
- **c.** Would a wellness program increase or decrease the health insurance premiums that an insurance company would charge the university or corporation to provide insurance coverage? Briefly explain.

1.11 **[Related to Solved Problem 1.1]** The U.S. Postal Service (USPS) charges Amazon about $2 to deliver a package. The USPS argues that its contract with Amazon allows it to reduce the loss it suffers on its overall operations. A business writer for the *Washington Post* observes, "Looked at from the standpoint of incremental revenue (huge) minus these incremental expenses (modest), the Postal Service could very easily have come to the conclusion that, even at $2 a package, the Amazon contract was likely to be highly profitable." What does the writer mean by "incremental revenue" and "incremental expenses"? Why would he focus on incremental revenue and incremental cost rather than on total revenue and total cost?

1.12 **[Related to Solved Problem 1.1]** Late in the semester, a friend tells you, "I was going to drop my psychology course so I could concentrate on my other courses, but I had already put so much time into the course that I decided not to drop it." What do you think of your friend's reasoning? Would it make a difference to your answer if your friend has to pass the psychology course at some point to graduate? Briefly explain.

1.13 In a paper written by Bentley College economists Patricia M. Flynn and Michael A. Quinn, the authors state:

> We find evidence that Economics is a good choice of major for those aspiring to become a CEO [chief executive officer]. When adjusting for the size of the pool of graduates, those with undergraduate degrees in Economics are shown to have had a greater likelihood of becoming an S&P 500 CEO than any other major.

A list of famous economics majors published by Marietta College includes business leaders Elon Musk, Warren Buffett, Steve Ballmer, David Rockefeller, Arnold Schwarzenegger, Bill Belichick, Diane von Furstenberg, and Sam Walton, as well as Presidents George H.W. Bush, Gerald Ford, Ronald Reagan, and Donald Trump and Supreme Court Justice Sandra Day O'Connor. Why might studying economics be particularly good preparation for being the top manager of a corporation or a leader in government?

1.2 The Economic Problem That Every Society Must Solve

LEARNING OBJECTIVE: Discuss how an economy answers these questions: What goods and services will be produced? How will the goods and services be produced? Who will receive the goods and services produced?

Summary

Society faces **trade-offs**: Producing more of one good or service means producing less of another good or service. The **opportunity cost** of any activity—such as producing a good or service—is the highest-valued alternative that must be given up to engage in that activity. The choices of consumers, firms, and governments determine what goods and services will be produced. Firms choose how to produce the goods and services they sell. In the United States, who receives the goods and services produced depends largely on how income is distributed in the marketplace. In a **centrally planned economy**, most economic decisions are made by the government. In a **market economy**, most economic decisions are made by consumers and firms. Most economies, including that of the United States, are **mixed economies** in which most economic decisions are made by consumers and firms but in which the government also plays a significant role. There are two types of efficiency: (1) **productive efficiency**, which occurs when a good or service is produced at the lowest possible cost, and (2) **allocative efficiency**, which occurs when production corresponds with consumer preferences. **Voluntary exchange** is a situation that occurs in markets when both the buyer and the seller of a product are made better off by the transaction. **Equity** usually involves a fair distribution of economic benefits. Government policymakers often face a trade-off between equity and efficiency.

Review Questions

2.1 Why does scarcity imply that every society and every individual face trade-offs?

2.2 What are the three economic questions that every society must answer? Briefly discuss the differences in the way centrally planned, market, and mixed economies answer these questions.

2.3 What is the difference between productive efficiency and allocative efficiency?

2.4 What is the difference between efficiency and equity? Why do government policymakers often face a trade-off between efficiency and equity?

Problems and Applications

2.5 According to forbes.com, in May 2023, Elon Musk was the world's second richest person, with wealth of $185 billion. Does Elon Musk face scarcity? Does everyone? Are there any exceptions?

2.6 An article in the *Wall Street Journal* in 2020 explained that the amount of remdesivir, the first drug shown to effectively treat Covid–19, was less than the amount needed to treat all patients who were infected with the virus. In the article, a doctor and ethicist at the University of Pittsburgh stated: "We're in a situation of scarcity and we have to find a fair way to allocate this scarce resource." Hospitals affiliated with the University of Pittsburgh used a lottery system to decide which patients would be given remdesivir. West Virginia hospitals used a first come, first served (FCFS) approach to ration remdesivir.

- **a.** Why was remdesivir a scarce resource in 2020?
- **b.** Was a lottery system a fairer way than FCFS to allocate remdesivir?
- **c.** What was the opportunity cost of distributing remdesivir to a West Virginia hospital patient in 2020?
- **d.** If hospitals had had enough remdesivir to treat all of the patients who had the Covid–19 virus in 2020, would remdesivir still have been a scarce resource?

2.7 Consider an organization dedicated to helping people with low incomes. The members of the organization are discussing alternative methods of aiding people with low incomes, when a proponent of one particular method asserts, "If even one low-income person is helped by this method, then all our time and money would have been worth it." If you were a member of the organization, how would you reply to this assertion?

2.8 College football attendance, especially student attendance, has been declining. In 2022, home attendance at major college football games was the lowest since 1996 (apart from 2020 and 2021, when attendance was affected by Covid–19 restrictions at some stadiums). The opportunity cost of engaging in an activity is the value of the best alternative that must be given up in order to engage in that activity. How does your opportunity cost of attending a game compare with the opportunity cost facing a college student 25 years ago? Can this change account for the decline in college football attendance? Briefly explain.

2.9 In a market economy, why does a firm have a strong incentive to be productively efficient and allocatively efficient? What does the firm earn if it is productively and allocatively efficient, and what happens if it is not?

2.10 Alberto Chong of Georgia State University and several colleagues conducted an experiment to test the efficiency of government postal services around the world. They mailed letters to nonexistent businesses in 159 countries and kept track of how many of the letters were returned. Was this test most relevant to evaluating the productive efficiency or the allocative efficiency of these postal services? Briefly explain.

2.11 The Food and Drug Administration (FDA) is part of the federal government's Department of Health and Human Services. Among its other functions, the FDA evaluates the safety and effectiveness of drugs and medical devices. For example, in 2020, the FDA had to approve Covid–19 vaccines from pharmaceutical firms Pfizer and Moderna for emergency use before the vaccines could be distributed. In a centrally planned economy, the government decides how resources will be allocated. In a market economy, the decisions of households and firms interacting in markets allocate resources. Briefly explain which of the following statements is more accurate.

- **a.** The regulation of the production and sale of drugs and medical devices in the United States is an example of how resources are allocated in a centrally planned economy.
- **b.** The regulation of the production and sale of drugs and medical devices in the United States is an example of how resources are allocated in a market economy.

2.12 Leonard Fleck, a philosophy professor at Michigan State University, has written:

> When it comes to health care in America, we have limited resources for unlimited health care needs. We want everything contemporary medical technology can offer that will improve the length or quality of our lives as we age. But as presently healthy taxpayers, we want costs controlled.

Why is it necessary for all economic systems to limit services such as health care? How does a market system prevent people from getting as many goods and services as they want?

2.13 Steven Pearlstein, a columnist for the *Washington Post*, observed, "Arthur Okun's book . . . *Equality and Efficiency: The Big Tradeoff*, remains a classic." Why is there a trade-off between equality and efficiency? Why might an economist write an entire book on the subject?

2.14 In a column in the *Wall Street Journal*, financial journalist Roger Lowenstein argued that "once you start looking at the world through the lens of trade-offs, policy debates become less about right and wrong and more matters of give and take."

a. What does Lowenstein mean by "matters of give and take"?

b. Do you agree with Lowenstein's description of the nature of policy debates? Briefly explain.

2.15 Suppose that your college decides to give away 1,000 tickets to the football game against your school's biggest rival. The athletic department elects to distribute the tickets by giving them away to the first 1,000 students who show up at the department's office at 10 A.M. the following Monday.

a. Which groups of students will be most likely to try to get the tickets? Think of specific examples and then generalize.

b. What is the opportunity cost to students of distributing the tickets this way?

c. Productive efficiency occurs when a good or service (such as the distribution of tickets) is produced at the lowest possible cost. Is this method an efficient way to distribute the tickets? If possible, think of a more efficient method of distributing the tickets.

d. Is this method an equitable way to distribute the tickets? Briefly explain.

1.3 Economic Models

LEARNING OBJECTIVE: Explain how economists use models to analyze economic events and government policies.

Summary

An **economic variable** is something measurable that can have different values, such as the number of people employed in manufacturing. **Economic models** are simplified versions of reality used to analyze real-world economic situations. Economists accept and use an economic model if it leads to hypotheses that are confirmed by statistical analysis. In many cases, the acceptance is tentative, however, pending the gathering of new data or further statistical analysis. Economics is a *social science* because it applies the scientific method to the study of the interactions among individuals. Economics is concerned with positive analysis rather than normative analysis. **Positive analysis** is concerned with what is. **Normative analysis** is concerned with what ought to be. As a social science, economics considers human behavior in every context of decision making, not just in business.

Review Questions

3.1 Why do economists use models? How are economic data used to test models?

3.2 Describe the five steps economists follow to arrive at a useful economic model.

3.3 What is the difference between normative analysis and positive analysis? Is economics concerned mainly with normative analysis or positive analysis? Briefly explain.

Problems and Applications

3.4 Suppose an economist develops an economic model to analyze how a tax on soda affects the consumption of soda. The economist is confident that the model is logically consistent with the principles of economics. Unfortunately, when the economist analyzes data on the change in soda consumption after a state enacts a soda tax, she finds that the data are *inconsistent* with the conclusions of the model. (This outcome is sometimes characterized as a model working well in theory but failing in practice.) What should the economist do next?

3.5 Suppose that Dr. Strangelove's theory is that the price of mushrooms is determined by the activity of subatomic particles that exist in another universe that is parallel to ours. When the subatomic particles are emitted in profusion, the price of mushrooms is high. When subatomic particle emissions are low, the price of mushrooms is also low. How would you go about testing Dr. Strangelove's theory? Discuss whether this theory is useful.

3.6 [**Related to the Don't Let This Happen to You**] Briefly explain which of the following statements represent positive analysis and which represent normative analysis.

a. A 50-cent-per-pack tax on cigarettes will lead to a 12 percent reduction in smoking by teenagers.

b. The federal government should spend more on research to reduce opioid addiction.

c. Rising wheat prices will increase bread prices.

d. The price of coffee at Starbucks is too high.

3.7 [**Related to the Don't Let This Happen to You**] Annie Lowery, a business reporter, wrote the book *Give People Money: How a Universal Basic Income Would End Poverty, Revolutionize Work, and Remake the World*, which advocates that the federal government adopt a universal basic income (UBI) under which every person in the country would receive a monthly check of $500 to $1,000. She argues that "in a society as rich as ours . . . everyone deserves a guarantee of financial security." Do you agree with Lowery that it's the role of the federal government to guarantee that people have financial security? What are the potential trade-offs if the federal government took on this role?

3.8 **[Related to the Don't Let This Happen to You]** In the *Apply the Concept* "Will Changes to the Federal Student Loan Program Unintentionally Give Colleges an Incentive to Increase Tuition?" we mentioned the potential unintended consequences resulting from President Biden's changes to the federal student loan program. Can we conclude that because of these unintended consequences, changes to the loan program are a bad idea? Briefly explain.

3.9 **[Related to the Apply the Concept "What Can Economics Contribute to the Debate over Tariffs?"]** The *Apply the Concept* feature explains that there are both positive and normative aspects to the debate over whether the federal government should enact tariffs on imports from China. What economic statistics would be most useful in evaluating the positive elements in this debate? Assuming that these statistics are available or could be gathered, are they likely to resolve the normative issues in this debate?

3.10 An editorial in the *Wall Street Journal* asserted that "whenever the government is in charge of allocating a scarce good in high demand, there will be rationing. . . . So it is with vaccines. . . . Basing eligibility . . . from oldest to youngest from now on is simple . . . and fair."

- **a.** Did the editors of the *Wall Street Journal* make a positive economic statement or a normative economic statement when they wrote "Whenever the government is in charge of allocating a scarce good in high demand, there will be rationing"?
- **b.** Did the editors of the *Wall Street Journal* make a positive economic statement or a normative economic statement when they claimed that rationing vaccines based on a patient's age, from the oldest to the youngest, "is simple . . . and fair"?

3.11 **[Related to the Chapter Opener]** An article in the *Wall Street Journal* made the following comment about President Biden's policies to increase manufacturing employment in the United States: "Biden's 'buy American' proposals echo those of previous presidents, including President Trump, who issued executive orders to spur more federal purchases of U.S. goods and sought to use tariffs to disadvantage foreign producers."

- **a.** How does a tariff on imported goods "disadvantage foreign producers"?
- **b.** During his term in office, President Trump imposed tariffs on imports of foreign steel. Briefly explain whether a tariff on imported steel is likely to help or hurt each of the following groups.
  - **i.** U.S. firms, such as automobile firms, that use steel to make their products
  - **ii.** U.S. consumers
  - **iii.** Workers at U.S. steel firms
  - **iv.** People who had invested in U.S. steel firms
- **c.** Would people in the United States who are helped by the steel tariffs necessarily support the tariffs? Would people who were hurt by the tariffs necessarily oppose the tariffs? Briefly explain.

3.12 **[Related to the Economics in Your Life & Career]** Suppose you are building an economic model to forecast the number of people employed in U.S. manufacturing in 2031. Should your model take into account possible changes in economic policy enacted by the president and Congress? Briefly explain.

3.13 To receive a medical license in the United States, a doctor must complete a residency program at a hospital. Hospitals are not free to expand their residency programs in a particular medical specialty without approval from a residency review committee (RRC) composed of physicians in that specialty. A hospital that does not abide by the rulings of the RRC risks losing its accreditation from the Accreditation Council for Graduate Medical Education (ACGME). The RRCs and ACGME argue that this system ensures that residency programs do not expand to the point where they are not providing residents with high-quality training.

- **a.** How does this system help protect consumers?
- **b.** Is it possible that this system protects the financial interests of doctors more than it protects the well-being of consumers? Briefly explain.
- **c.** Discuss whether you consider this system to be good or bad. Is your conclusion an example of normative economics or of positive economics? Briefly explain.

1.4 Microeconomics and Macroeconomics

LEARNING OBJECTIVE: Distinguish between microeconomics and macroeconomics.

Summary

Microeconomics is the study of how households and firms make choices, how they interact in markets, and how the government attempts to influence their choices. **Macroeconomics** is the study of the economy as a whole, including topics such as inflation, unemployment, and economic growth.

Review Questions

4.1 Briefly discuss the difference between microeconomics and macroeconomics.

4.2 Is every economic issue either strictly microeconomic or strictly macroeconomic? Briefly explain.

Problems and Applications

4.3 Briefly explain whether each of the following is primarily a microeconomic issue or a macroeconomic issue.

- **a.** The effect of higher cigarette taxes on the quantity of cigarettes sold
- **b.** The effect of higher income taxes on the total amount of consumer spending
- **c.** The reasons the economies of East Asian countries grow faster than the economies of sub-Saharan African countries
- **d.** The reasons for low rates of profit in the airline industry

4.4 Briefly explain whether you agree with the following assertion:

> Microeconomics is concerned with things that happen in one particular place, such as the unemployment rate in one city. In contrast, macroeconomics is concerned with things that affect the country as a whole, such as how the rate of teenage smoking in the United States would be affected by an increase in the tax on cigarettes.

Critical Thinking Exercises

CT1.1 For this exercise, your instructor may assign you to a group. As you saw in this chapter, an economy must answer three key questions: what to produce, how to produce it, and who receives the goods and services produced. High-income countries like the United States have capitalist economic systems, which economists call *market economies*. This exercise focuses on the ideas about capitalism that you and other students bring to this class so we can connect what you already know with how economists think about the economic system (and they think a lot about it!). Using the concepts in this chapter, explain common complaints you have read about capitalism or that you have heard from others. Be sure to use the following terms or concepts in your analysis: *market, market economy, equity, allocative efficiency, centrally planned economy, normative analysis,* and *positive analysis*. Each member of the group should describe at least one complaint about capitalism and use at least one of the terms or concepts listed above. Each group should then produce a one-page paper for this analysis to either turn in or to discuss in class.

CT1.2 Suppose that you're very athletic. For example, you might like to run, swim, play volleyball, or bike. You would like to perform better at your next competition. Perhaps you want to run a 5-kilometer race 1 minute faster, or perhaps you want your team to advance further in a team sports competition, like volleyball. What concept can you use from this chapter to design your training program? *Hint:* This question is not about using concepts like markets, positive or normative analysis, or assuming that people act rationally—but there is one concept introduced in this chapter that is applicable to improving your athletic performance.

Appendix

LEARNING OBJECTIVE: Use graphs and formulas to analyze economic situations.

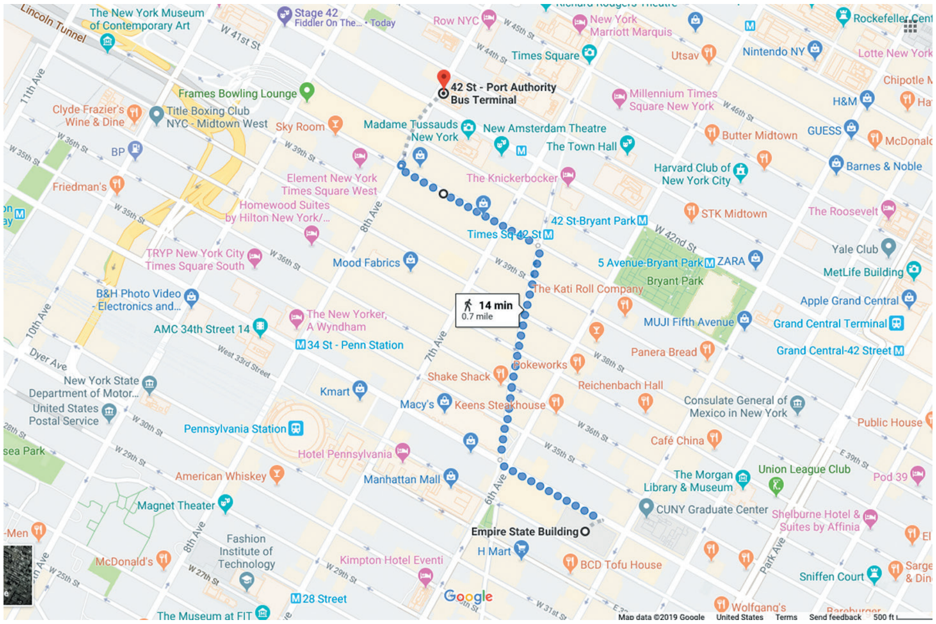
Using Graphs and Formulas

Economics textbooks, websites, and newspaper and magazine articles that discuss business and economics often use graphs to illustrate key ideas. Graphs serve two useful purposes: (1) They simplify economic ideas; and (2) they make the ideas more concrete so people can apply them to real-world problems. Economic, business, and policy issues can be complicated, but a graph can help cut through complications and highlight the key relationships needed to understand the issue. In that sense, a graph can be like a street map.

Suppose you take a bus to New York City to see the Empire State Building. After arriving at the Port Authority Bus Terminal, you will probably use an app such as Google Maps to find your way to the Empire State Building.

Maps are simplified versions of reality. The following map shows the streets in this part of New York City and some of the most important buildings. The map does not show most stores, most buildings, or the names, addresses, and telephone numbers of the people who live and work in the area. In fact, the map shows almost nothing about the messy reality of life in this section of New York City, except how the streets are laid out, which is the essential information you need to get from the Port Authority Bus Terminal to the Empire State Building.

Think about someone who says, “I know how to get around in the city, but I just can’t figure out how to read a map.” It certainly is possible to find your destination in a city without a map, but it’s a lot easier with one. The same is true of using graphs in economics. It is possible to arrive at a solution to a real-world problem in economics and business without using graphs, but it is usually a lot easier if you use them.


42 St - Port Authority Bus Terminal
14 min
0.7 mile
Empire State Building
Times Sq-42 St
42 St-Bryant Park
Bryant Park
5 Avenue-Bryant Park
Times Square
34 St - Penn Station
Pennsylvania Station
Grand Central Terminal
Grand Central-42 Street
Macy's
Madison Square Garden
8th Ave
7th Ave
6th Ave
Park Ave
W 42nd St
W 39th St
W 38th St
W 36th St
W 35th St
W 34th St
Map data ©2019 Google
Google

Google Maps/Alphabet, Inc.

Maps are simplified versions of reality. This map shows only the streets and most important buildings in this area of New York City.

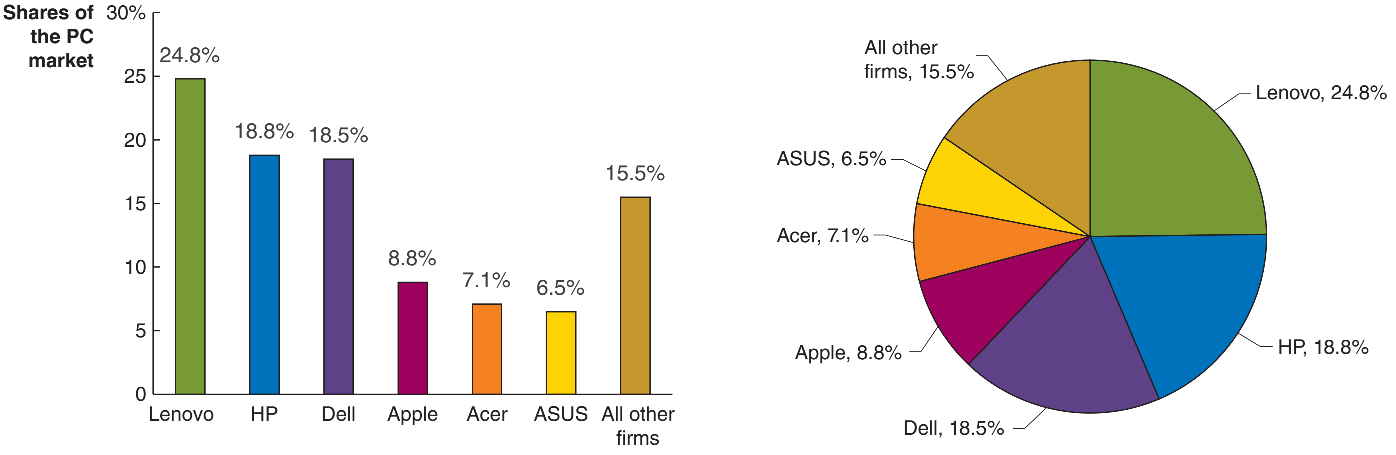
Several simple mathematical formulas are also helpful in applying economic ideas. With practice, you will become familiar with the graphs and formulas in this text, and you will know how to use them to analyze problems that would otherwise seem very difficult. What follows is a brief review of how graphs and formulas are used.

Graphs of One Variable

A firm's *market share* is its percentage of industry sales. Figure 1A.1 displays values for market shares in the world laptop market during the period from April to June 2022, using two common types of graphs. Panel (a) displays the information about market shares as a *bar graph*, with the market share of each firm represented by the height of its bar. Panel (b) displays the same information as a *pie chart*, with the market share of each firm represented by the size of its slice of the pie.

Information about an economic variable is also often displayed in a *time-series graph*, like Figure 1A.2, which shows on a coordinate grid how the values of a variable change over time. In a coordinate grid, we can measure the value of one variable along the vertical axis (or *y*-axis) and the value of another variable along the horizontal axis (or *x*-axis). The point where the vertical axis intersects the horizontal axis is called the *origin*. At the origin, the value of both variables is zero. The points on a coordinate grid represent values of the two variables.

Figure 1A.2 measures the value of Apple's sales of Mac computers on the vertical axis, and it measures time on the horizontal axis. In time-series graphs, the height of the line at each date shows the value of the variable measured on the vertical axis. Both panels of Figure 1A.2 show the value of Apple's worldwide Mac sales during each year from 2015 to 2022. The difference between panel (a) and panel (b) illustrates the importance of the scale used in a time-series graph. In panel (a), the vertical axis starts at 0, and the distance between each pair of values shown is the same. In this panel, the increase in Apple's sales during 2021 and 2022 appears relatively small. In panel (b), the scale on the vertical axis is truncated, and although it starts at 0, it jumps to $20 billion. As a result, the distance on the vertical axis from 0 to $20 billion is much smaller than the distance from $20 billion to $40 billion. The slashes (//) near the bottom of the axis indicate that

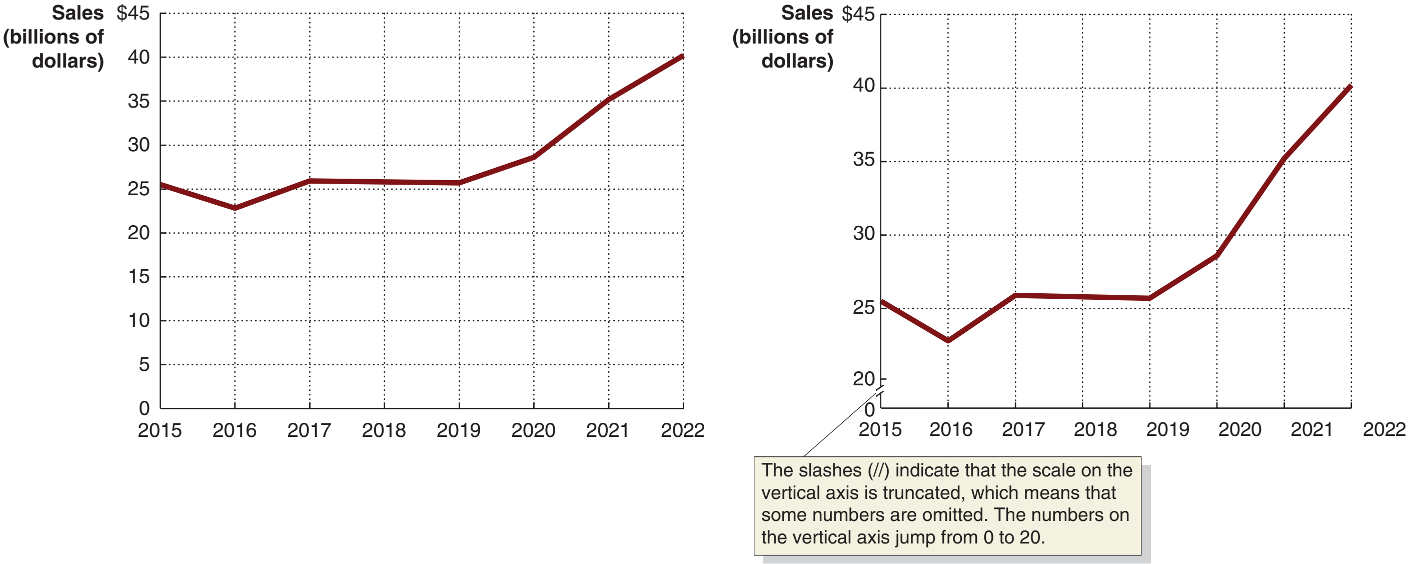


(a) Bar graph **(b) Pie chart**

Figure 1A.1 **Bar Graph and Pie Chart**

Values for an economic variable are often displayed as a bar graph or a pie chart. In this case, panel (a) shows market share data for the world laptop market as a bar graph, with the market share of each group of firms represented by the height of its bar. Panel (b) displays the same information as a pie chart, with the market share of each group of firms represented by the size of its slice of the pie.

Source: "Mac Shipments Up in Q2 2022 amid Worldwide PC Shipment Decline," macrumors.com, July 11, 2022.



The slashes (//) indicate that the scale on the vertical axis is truncated, which means that some numbers are omitted. The numbers on the vertical axis jump from 0 to 20.

(a) Time-series graph where the scale is not truncated

(b) Time-series graph with truncated scale

Figure 1A.2 **Time-Series Graphs**

Both panels present time-series graphs of Apple's worldwide sales of Macs during each year from 2015 to 2022. In panel (a), the vertical axis starts at 0, and the distance between each pair of values shown is the same. In panel (b), the scale on the vertical axis is truncated, and although it starts at 0, it then jumps to $20 billion. As a result, the fluctuations in Apple's sales appear smaller in panel (a) than in panel (b).

Source: Apple, *Annual Report*, various years.

the scale is truncated. The increase in Apple's sales during 2021 and 2022 appears much larger in panel (b) than it appears in panel (a). (Technically, the horizontal axis in both panels is also truncated because we start with 2015, not 0.)

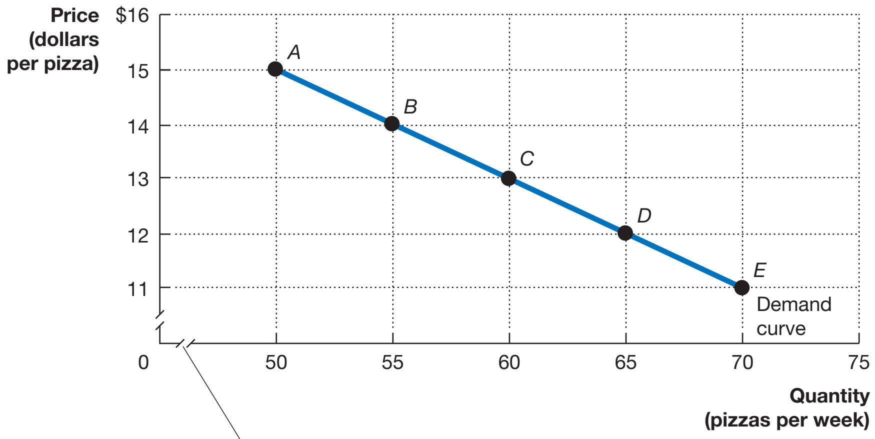
Graphs of Two Variables

We often use graphs to show the relationship between two variables. Suppose you are interested in the relationship between the price of a cheese pizza and the quantity of pizzas sold per week in your hometown. A graph showing the relationship between the price of a good and the quantity of the good demanded at each price is called a *demand curve*. (As we will discuss in Chapter 3, in drawing a demand curve for a good, we have to hold constant any variables other than price that might affect the willingness of consumers to buy the good.) Figure 1A.3 shows the data collected on price and quantity. The figure shows a two-dimensional grid that measures the price of pizza along the *y*-axis and the quantity of pizzas sold per week along the *x*-axis. Each point on the grid represents one of the price and quantity combinations listed in the table. We can connect the points to form the demand curve for pizza in your town. Notice that the scales on both axes in the graph are truncated. In this case, truncating the axes allows the graph to illustrate more clearly the relationship between price and quantity by excluding low prices and quantities.

Slopes of Lines

Once you have plotted the data in Figure 1A.3, you may be interested in how much the quantity of pizzas sold increases as the price decreases. The *slope* of a line tells us how much the variable we are measuring on the *y*-axis changes as the variable we are measuring on the *x*-axis changes. We can use the Greek letter delta (Δ) to stand for the change in

Price (dollars per pizza)	Quantity (pizzas per week)	Point
$15	50	*A*
14	55	*B*
13	60	*C*
12	65	*D*
11	70	*E*



As you learned in Figure 1A.2, the slashes (//) indicate that the scales on the axes are truncated, which means that numbers are omitted: On the horizontal axis numbers jump from 0 to 50, and on the vertical axis numbers jump from 0 to 11.

Figure 1A.3

Plotting Price and Quantity Points in a Graph

The figure shows a two-dimensional grid that measures the price of pizza along the vertical axis (or *y*-axis) and the quantity of pizzas sold per week along the horizontal axis (or *x*-axis). Each point on the grid represents one of the price and quantity combinations listed in the table. By connecting the points with a line, we can better illustrate the relationship between the two variables.

a variable. The slope is sometimes called the rise over the run. So, we have several ways of expressing slope:

$$\text{Slope} = \frac{\text{Change in value on the vertical axis}}{\text{Change in value on the horizontal axis}} = \frac{\Delta y}{\Delta x} = \frac{\text{Rise}}{\text{Run}}.$$

Figure 1A.4 reproduces the graph from Figure 1A.3. Because the slope of a straight line is the same at any point, we can use any two points in the figure to calculate the slope of the line. For example, when the price of pizza decreases from \$14 to \$12, the quantity of pizzas sold increases from 55 per week to 65 per week. Therefore, the slope is:

$$\text{Slope} = \frac{\Delta\ \text{Price of pizza}}{\Delta\ \text{Quantity of pizza}} = \frac{(\$12 - \$14)}{(65 - 55)} = \frac{-2}{10} = -0.2.$$

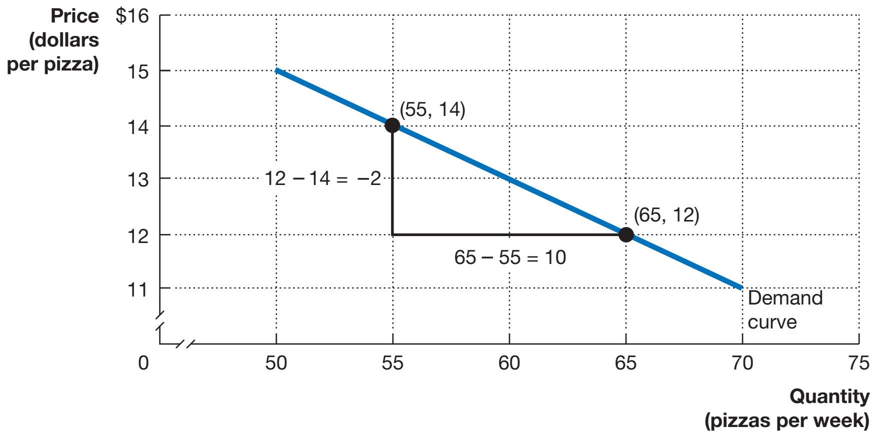


Figure 1A.4

Calculating the Slope of a Line

We can calculate the slope of a line as the change in the value of the variable on the *y*-axis divided by the change in the value of the variable on the *x*-axis. Because the slope of a straight line is constant, we can use any two points in the figure to calculate the slope of the line. For example, when the price of pizza decreases from \$14 to \$12, the quantity of pizzas demanded increases from 55 per week to 65 per week. So, the slope of this line equals -2 divided by 10, or -0.2.

The slope of this line shows us how responsive consumers in your hometown are to changes in the price of pizza. The larger the value of the slope (ignoring the negative sign), the steeper the line will be, which indicates that not many additional pizzas are sold when the price falls. The smaller the value of the slope, the flatter the line will be, which indicates a greater increase in pizzas sold when the price falls.

Taking into Account More than Two Variables on a Graph

The demand curve in Figure 1A.4 shows the relationship between the price of pizza and the quantity of pizza demanded, but we know that the quantity of any good demanded depends on more than just the price of the good. For example, the quantity of pizzas demanded during a particular week in your town can be affected by other variables, such as the price of hamburgers, whether an advertising campaign by local pizza parlors has begun that week, and so on. Allowing the values of any other variables to change will cause the position of the demand curve in the graph to change.

Suppose that the demand curve in Figure 1A.4 was drawn holding the price of hamburgers constant, at $1.50. If the price of hamburgers rises to $2.00, some consumers will switch from buying hamburgers to buying pizza, and more pizzas will be demanded at every price. The result on the graph will be to shift the line representing the demand curve to the right. Similarly, if the price of hamburgers falls from $1.50 to $1.00, some consumers will switch from buying pizza to buying hamburgers, and fewer pizzas will be demanded at every price. The result on the graph will be to shift the line representing the demand curve to the left.

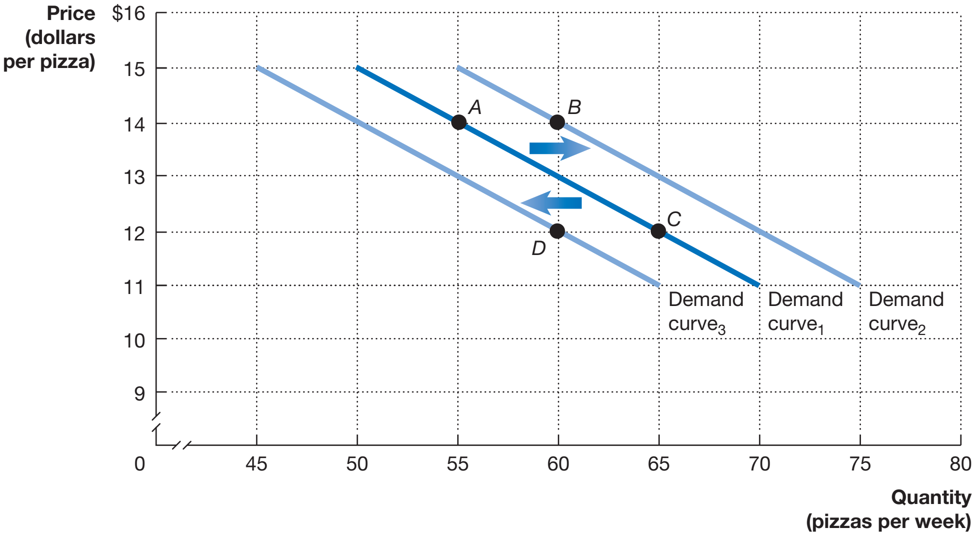
The table in Figure 1A.5 shows the effect of a change in the price of hamburgers on the quantity of pizzas demanded. On the graph, suppose that at first we are on the line labeled Demand curve$_1$. If the price of pizza is $14 (point *A*), an increase

Figure 1A.5

Showing Three Variables on a Graph

The demand curve for pizza shows the relationship between the price of pizzas and the quantity of pizzas demanded, *holding constant other factors that might affect the willingness of consumers to buy pizza*. If the price of pizza is $14 (point *A*), an increase in the price of hamburgers from $1.50 to $2.00 increases the quantity of pizzas demanded from 55 to 60 per week (point *B*) and shifts the demand curve to Demand curve$_2$. Or, if we start on Demand curve$_1$ and the price of pizza is $12 (point *C*), a decrease in the price of hamburgers from $1.50 to $1.00 decreases the quantity of pizzas demanded from 65 to 60 per week (point *D*) and shifts the demand curve to Demand curve$_3$.

	Quantity (pizzas per week)		
Price (dollars per pizza)	When the Price of Hamburgers = $1.00	When the Price of Hamburgers = $1.50	When the Price of Hamburgers = $2.00
$15	45	50	55
14	50	55	60
13	55	60	65
12	60	65	70
11	65	70	75



in the price of hamburgers from \$1.50 to \$2.00 increases the quantity of pizzas demanded from 55 to 60 per week (point *B*) and shifts the demand curve to the right, to Demand curve$_2$. Or, if we start on Demand curve$_1$ and the price of pizza is \$12 (point *C*), a decrease in the price of hamburgers from \$1.50 to \$1.00 decreases the quantity of pizzas demanded from 65 to 60 per week (point *D*) and shifts the demand curve to the left, to Demand curve$_3$. By shifting the demand curve, we have taken into account the effect of changes in the value of a third variable: the price of hamburgers. We will use this technique of shifting curves to allow for the effects of additional variables many times in this book.

Positive and Negative Relationships

We can use graphs to show the relationships between any two variables. Sometimes the relationship between the variables is *negative,* meaning that as one variable increases in value, the other variable decreases in value. This was the case with the price of pizza and the quantity of pizzas demanded. The relationship between two variables can also be *positive,* meaning that the values of both variables increase or decrease together. For example, when the level of total income—or *disposable personal income*—received by households in the United States increases, the level of total *consumption spending*, which is spending by households on goods and services, also increases. The table in Figure 1A.6 shows the values (in billions of dollars) for income and consumption spending for 2018–2021. The graph plots the data from the table, with disposable personal income measured along the horizontal axis and consumption spending measured along the vertical axis.

Determining Cause and Effect

When we graph the relationship between two variables, we usually want to draw conclusions about whether changes in one variable are causing changes in the other variable. But the fact that the values of two variables move together, or are *correlated*, doesn't mean that changes in one variable are *causing* changes in the other variable. *In other words, correlation doesn't imply causality*. The following three examples highlight this important point and illustrate why you should be careful about identifying cause and effect.

Year	Disposable Personal Income (billions of dollars)	Consumption Spending (billions of dollars)
2018	\$15,609	\$13,905
2019	16,389	14,393
2020	17,596	14,116
2021	18,633	15,903

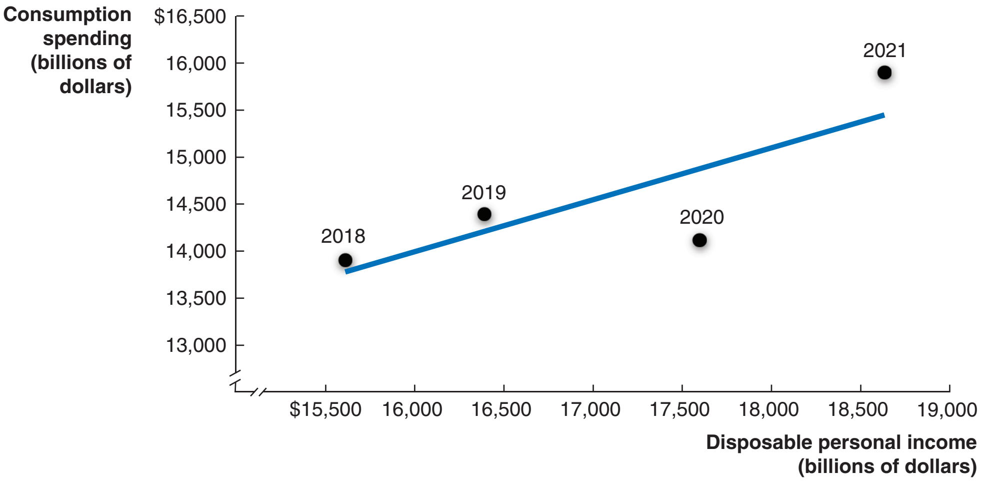


Figure 1A.6

Graphing the Positive Relationship between Income and Consumption

In a positive relationship between two economic variables, as one variable increases, the other variable also increases. This figure shows the positive relationship between disposable personal income and consumption spending. As disposable personal income in the United States has increased, so has consumption spending.

Source: U.S. Department of Commerce, Bureau of Economic Analysis.

Example 1: Does using fireplaces cause leaves to fall from trees?

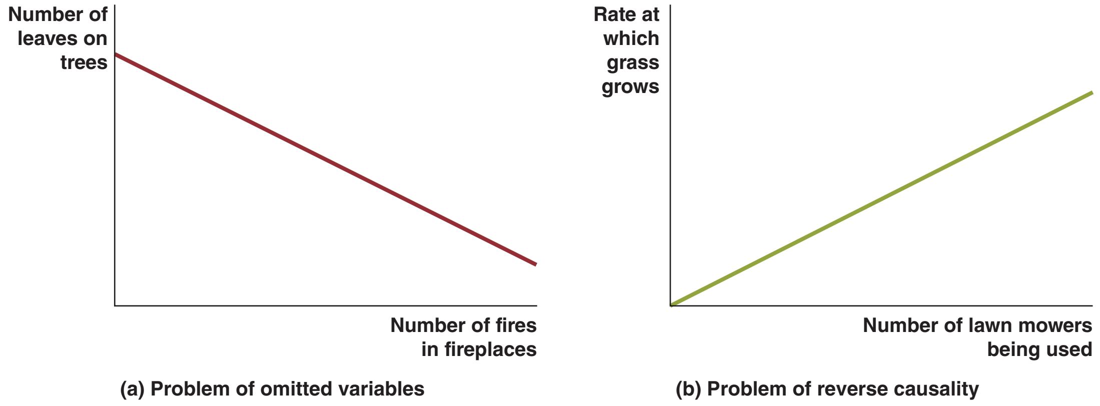
Suppose that over the course of a year, you graph the number of homes in a neighborhood that have fires burning in their fireplaces and the number of leaves on trees in the neighborhood and you get a relationship like that shown in panel (a) of Figure 1A.7: The more fireplaces in use in the neighborhood, the fewer leaves the trees have. So, there is a strong *correlation* between the number of fireplaces in use and the number of leaves on trees. Can we draw the conclusion from this graph that using a fireplace *causes* trees to lose their leaves? We know, of course, that such a conclusion is incorrect. In spring and summer, there are relatively few fireplaces being used, and the trees are full of leaves. In the fall, as trees begin to lose their leaves, fireplaces are used more frequently. And in winter, many fireplaces are being used and many trees have lost all their leaves. The reason that the graph in Figure 1A.7 is misleading in terms of cause and effect is that there is obviously an *omitted variable* in the analysis: the season of the year. An omitted variable is a variable that affects the other variables in the analysis, and its omission can lead to false conclusions about cause and effect.

Example 2: What causes lung cancer?

Although in the first example the omitted variable is obvious, there are many debates about cause and effect where the existence of an omitted variable has not been clear. For instance, it has been known for many years that people who smoke cigarettes suffer from higher rates of lung cancer than do nonsmokers. For some time, tobacco companies and some scientists argued that there was an omitted variable—perhaps failure to exercise or psychological stress—that made some people both more likely to smoke and more likely to develop lung cancer. If this omitted variable existed, then the finding that smokers were more likely to develop lung cancer would not have been evidence that smoking *caused* lung cancer. In this case, however, nearly all scientists eventually concluded that the omitted variable did not exist and that, in fact, smoking does cause lung cancer.

Example 3: Does mowing your lawn cause the grass to grow faster?

A related problem in determining cause and effect is known as *reverse causality*. The error of reverse causality occurs when we conclude that changes in variable X cause changes in variable Y when, in fact, it is actually changes in variable Y that cause changes in variable X. For example, panel (b) of Figure 1A.7 plots the number of lawn mowers being



(a) Problem of omitted variables

(b) Problem of reverse causality

Figure 1A.7 **Determining Cause and Effect**

Using graphs to draw conclusions about cause and effect can be hazardous. In panel (a), we see that there are fewer leaves on the trees in a neighborhood when many homes have fires burning in their fireplaces. We cannot draw the conclusion that using fireplaces causes the leaves to fall because we have an *omitted variable*: the season of the year. In panel (b), we see that more lawn mowers are used in a neighborhood during times when the grass grows rapidly and fewer lawn mowers are used when the grass grows slowly. Concluding that using lawn mowers *causes* the grass to grow faster would be making the error of *reverse causality*.

used in a neighborhood against the rate at which grass on lawns in the neighborhood is growing. We could conclude from this graph that using lawn mowers *causes* the grass to grow faster. We know, however, that in reality, the causality is in the other direction: Rapidly growing grass during the spring and summer causes the increased use of lawn mowers, and slowly growing grass in the fall or winter or during periods of low rainfall causes the decreased use of lawn mowers.

Once again, in this example, the potential error of reverse causality is obvious. In many economic debates, however, cause and effect can be more difficult to determine. For example, changes in the money supply or the total amount of money in the economy tend to occur at the same time as changes in the total amount of income earned by people in the economy. A famous debate in economics was about whether the changes in the money supply caused the changes in total income or whether the changes in total income caused the changes in the money supply. Each side in the debate accused the other side of committing the error of reverse causality.

Are Graphs of Economic Relationships Always Straight Lines?

The graphs of relationships between two economic variables that we have drawn so far have been straight lines. The relationship between two variables is *linear* when it can be represented by a straight line. Few economic relationships are actually linear. For example, if we carefully plot data on the price of a product and the quantity demanded at each price, holding constant other variables that affect the quantity demanded, we will usually find a curved—or *nonlinear*—relationship rather than a linear relationship. In practice, however, it is often useful to approximate a nonlinear relationship with a linear relationship. If the relationship is reasonably close to being linear, the analysis is not significantly affected. In addition, it is easier to calculate the slope of a straight line, and it is also easier to calculate the area under a straight line. So, in this textbook, we often assume that the relationship between two economic variables is linear, even when we know that this assumption is not precisely correct.

Slopes of Nonlinear Curves

In some situations, we need to take into account the nonlinear nature of an economic relationship. For example, panel (a) of Figure 1A.8 shows the hypothetical relationship between Apple's total cost of producing iPhones and the quantity of iPhones produced. The relationship is curved rather than linear. In this case, the cost of production is increasing at an increasing rate, which often happens in manufacturing. In other words, as we move up the curve, its slope becomes larger. (Remember that with a straight line, the slope is always constant.) To see why, first remember that we calculate the slope of a curve by dividing the change in the variable on the *y*-axis by the change in the variable on the *x*-axis. As we move from point *A* to point *B*, the quantity produced increases by 1 million iPhones, while the total cost of production increases by $50 million. Farther up the curve, as we move from point *C* to point *D*, the change in quantity is the same—1 million iPhones—but the change in the total cost of production is now much larger—$250 million. Because the change in the *y* variable has increased, while the change in the *x* variable has remained the same, we know that the slope has increased.

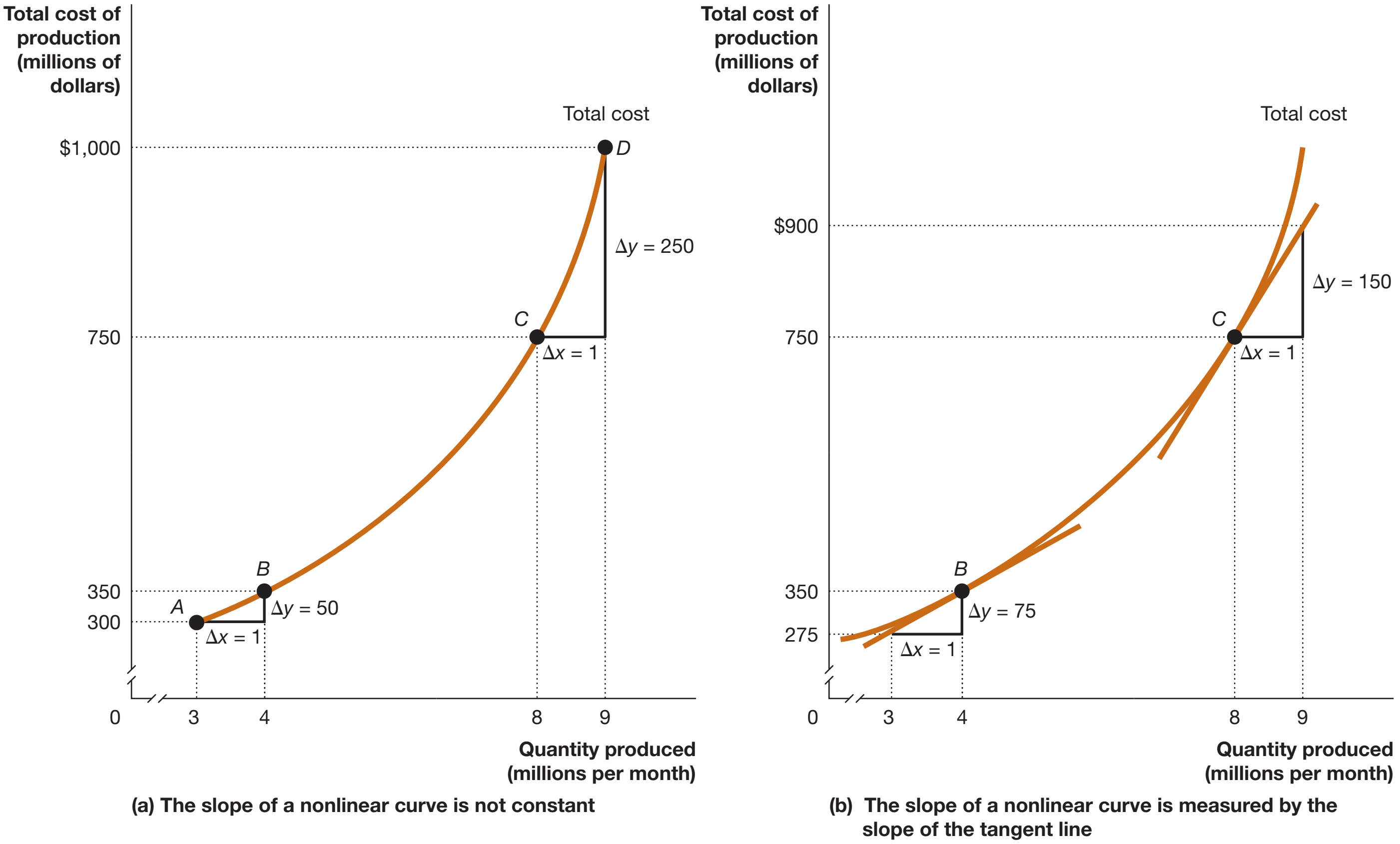
To measure the slope of a nonlinear curve at a particular point, we measure the slope of the line that is tangent to that curve at that point. This tangent line will touch the curve only at that point. We can measure the slope of the tangent line just as we would measure the slope of any other straight line. In panel (b), the tangent line at point *B* has a slope equal to:

$$\frac{\Delta \text{ Cost}}{\Delta \text{ Quantity}} = \frac{75}{1} = 75.$$

The tangent line at point *C* has a slope equal to:

$$\frac{\Delta \text{ Cost}}{\Delta \text{ Quantity}} = \frac{150}{1} = 150.$$

Once again, we see that the slope of the curve is larger at point *C* than at point *B*.



(a) The slope of a nonlinear curve is not constant

(b) The slope of a nonlinear curve is measured by the slope of the tangent line

Figure 1A.8 **The Slope of a Nonlinear Curve**

The relationship between the quantity of Apple iPhones produced and the total cost of production is curved rather than linear. In panel (a), when we move from point *A* to point *B*, the quantity produced increases by 1 million iPhones, while the total cost of production increases by $50 million. Farther up the curve, as we move from point *C* to point *D*, the change in quantity is the same—1 million iPhones—but the change in the total cost of production is now much larger—$250 million. Because the change in the *y* variable has increased, while the change in the *x* variable has remained the same, we know that the slope has increased. In panel (b), we measure the slope of the curve at a particular point by calculating the slope of the tangent line at that point. The slope of the tangent line at point *B* is 75, and the slope of the tangent line at point *C* is 150.

Formulas

We have just seen that graphs are an important economic tool. In this section, we will review several useful formulas and show how to use them to summarize data and calculate important relationships.

Formula for a Percentage Change

The *percentage change* is the change in some economic variable, usually from one period to the next, expressed as a percentage. A key macroeconomic measure is the real gross domestic product (GDP). GDP is the value of all the final goods and services produced in a country during a year. "Real" GDP is corrected for the effects of inflation. When economists say that the U.S. economy grew 2.1 percent during 2022, they mean that real GDP was 2.1 percent higher in 2022 than it was in 2021. The formula for making this calculation is:

$$\left(\frac{\text{GDP}_{2022} - \text{GDP}_{2021}}{\text{GDP}_{2021}}\right) \times 100$$

or, more generally, for any two periods:

$$\text{Percentage change} = \left(\frac{\text{Value in the second period} - \text{Value in the first period}}{\text{Value in the first period}}\right) \times 100.$$

In this case, real GDP was $19,610 billion in 2021 and $20,018 billion in 2022. So, the growth rate of the U.S. economy during 2022:

$$\left(\frac{\$20{,}018 - \$19{,}610}{\$19{,}610}\right) \times 100 = 2.1\%.$$

Notice that it doesn't matter that in using the formula, we ignored the fact that GDP is measured in billions of dollars. In fact, when calculating percentage changes, *the units don't matter*. The percentage increase from $19,610 billion to $20,018 billion is exactly the same as the percentage increase from $19,610 to $20,018.

Formulas for the Areas of a Rectangle and a Triangle

Areas that form rectangles and triangles on graphs can have important economic meaning. For example, Figure 1A.9 shows the demand curve for Pepsi. Suppose that the price is currently $2.00 and that 125,000 bottles of Pepsi are sold at that price. A firm's *total revenue* is equal to the amount it receives from selling its product, or the quantity sold multiplied by the price. In this case, total revenue will equal 125,000 bottles times $2.00 per bottle, or $250,000.

The formula for the area of a rectangle is:

$$\text{Area of a rectangle} = \text{Base} \times \text{Height}.$$

In Figure 1A.9, the shaded rectangle also represents the firm's total revenue because its area is given by the base of 125,000 bottles multiplied by the price of $2.00 per bottle.

We will see in later chapters that areas that are triangles can also have economic significance. The formula for the area of a triangle is:

$$\text{Area of a triangle} = \frac{1}{2} \times \text{Base} \times \text{Height}.$$

The shaded area in Figure 1A.10 is a triangle. The base equals 150,000 − 125,000, or 25,000. Its height equals $2.00 − $1.50, or $0.50. Therefore, its area equals 1/2 × 25,000 × $0.50, or $6,250. Notice that the shaded area is a triangle only if the demand curve is a straight line, or linear. Not all demand curves are linear. However, the formula for the area of a triangle will usually still give a good approximation, even if the demand curve is not linear.

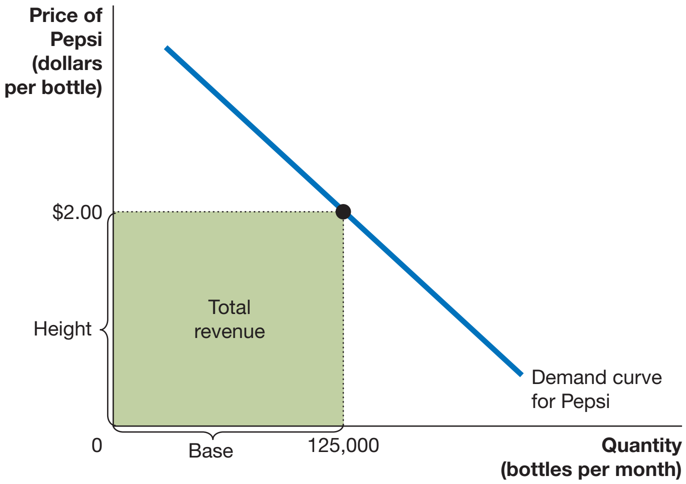


Figure 1A.9

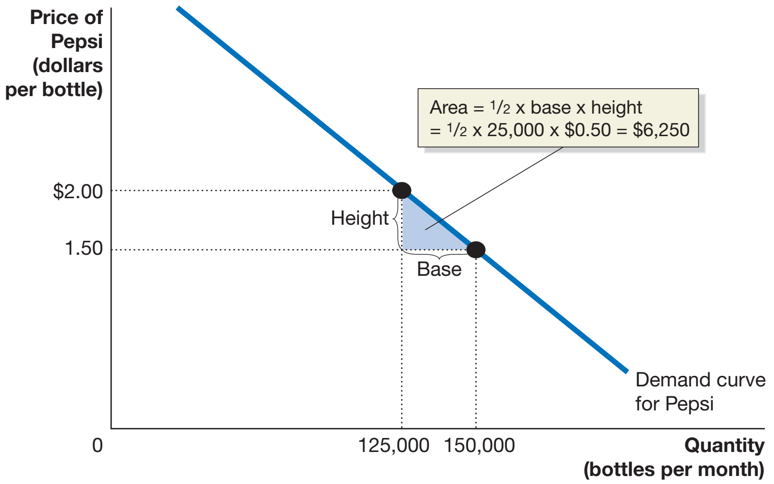
Showing a Firm's Total Revenue on a Graph

The area of a rectangle is equal to its base multiplied by its height. Total revenue is equal to quantity multiplied by price. Here, total revenue is equal to the quantity of 125,000 bottles times the price of $2.00 per bottle, or $250,000. The area of the shaded rectangle shows the firm's total revenue.

Figure 1A.10

The Area of a Triangle

The area of a triangle is equal to 1/2 multiplied by its base multiplied by its height. The area of the shaded triangle has a base equal to 150,000 – 125,000, or 25,000, and a height equal to \$2.00 – \$1.50, or \$0.50. Therefore, its area is equal to 1/2 × 25,000 × \$0.50, or \$6,250.



Summary of Using Formulas

You will encounter several other formulas in this book. Whenever you use a formula, you should follow these steps:

1. Make sure you understand the economic concept the formula represents.
2. Make sure you are using the correct formula for the problem you are solving.
3. Make sure the number you calculate using the formula is economically reasonable. For example, if you are using a formula to calculate a firm's revenue and your answer is a negative number, you know you made a mistake somewhere.

1A Using Graphs and Formulas

LEARNING OBJECTIVE: Use graphs and formulas to analyze economic situations.

Problems and Applications

1A.1 The following table shows the relationship between the price of custard pies and the number of pies Jacob buys per week.

Price (dollars per pie)	Quantity of Pies	Week
\$3.00	6	July 2
2.00	7	July 9
5.00	4	July 16
6.00	3	July 23
1.00	8	July 30
4.00	5	August 6

a. Is the relationship between the price of pies and the number of pies Jacob buys a positive relationship or a negative relationship?

b. Plot the data from the table on a graph similar to Figure 1A.3. Draw a straight line that best fits the points.

c. Calculate the slope of the line.

1A.2 The following table gives information about the quantity of glasses of lemonade demanded on sunny days and on overcast days.

Price (dollars per glass)	Quantity (glasses of lemonade per day)	Weather
\$0.80	30	Sunny
0.80	10	Overcast
0.70	40	Sunny
0.70	20	Overcast
0.60	50	Sunny
0.60	30	Overcast
0.50	60	Sunny
0.50	40	Overcast

Plot the data from the table on a graph similar to Figure 1A.5. Draw two straight lines representing the two demand curves: one for sunny days and one for overcast days.

1A.3 Use the information in the following table to calculate the percentage change in Apple's worldwide sales of Mac computers from one year to the next. (These are the data that are graphed in Figure 1A.2.)

a. During which year did sales fall at the highest rate?

b. During which year did sales increase at the highest rate?

Year	Apple's Worldwide Mac Sales (billions of dollars)
2015	$25.5
2016	22.8
2017	25.9
2018	25.8
2019	25.7
2020	28.6
2021	35.2
2022	40.2

1A.4 Real GDP in 2020 was $18,509 billion. Real GDP in 2021 was $19,610 billion. What was the percentage change in real GDP from 2020 to 2021? What do economists call the percentage change in real GDP from one year to the next?

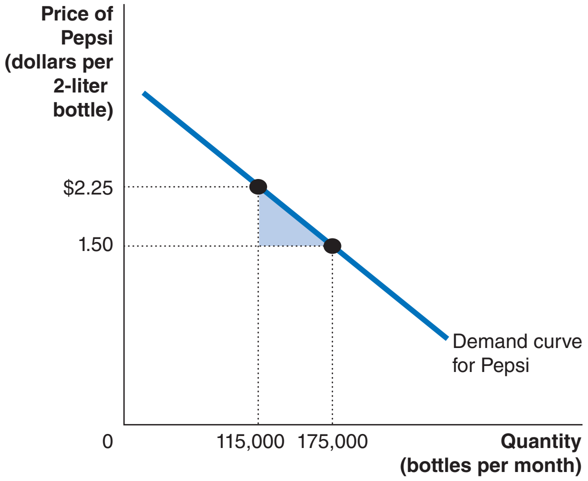
1A.5 Assume that the demand curve for Pepsi passes through the following two points:

Price per Bottle of Pepsi (in dollars)	Quantity (bottles)
$2.50	100,000
1.25	200,000

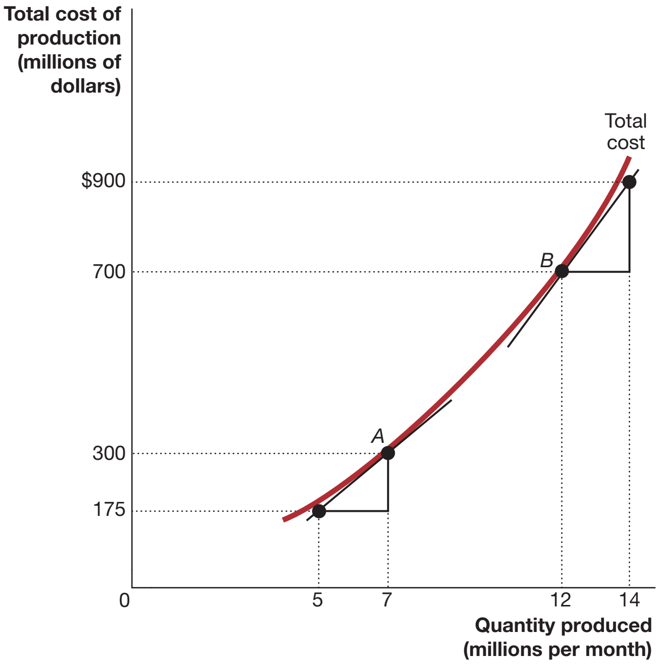
a. Draw a graph with a linear demand curve that passes through these two points.

b. Show on the graph the areas representing total revenue at each price. Give the value for total revenue at each price.

1A.6 What is the area of the triangle shown in the following figure?



1A.7 Calculate the slope of the total cost curve at point *A* and at point *B* in the following figure.



2 Trade-offs, Comparative Advantage, and the Market System

Ford Faces a Trade-Off at Its Dearborn, Michigan Plant

Are electric vehicles (EVs) the wave of the future? Most car manufacturers hope so because they are investing heavily in designing and assembling EVs. But in 2022, only about 6 percent of cars, sport utility vehicles (SUVs), minivans, and pickup trucks sold in the United States were electric.

Henry Ford pioneered the mass production of automobiles when he began manufacturing the Model T in a factory in Highland Park, Michigan, in 1908. As the first reliable, inexpensive car, the Model T was a huge success. For 20 years, Ford produced only one car model, so he wasn't concerned with an issue that is important to modern car companies: how many workers, machines, and other resources to allocate to the different models the firms produce. When Ford completed the River Rouge plant in Dearborn, Michigan, in 1928, it was the largest car factory in the world. For a number of years, the company continued to produce just one model.

Today, Ford Motor Company produces a variety of models in more than 30 plants in the United States and Canada. Ford's F-150 pickup truck is the best-selling vehicle of any kind in the United States and by far the most profitable vehicle that Ford produces. In 2022, the company assembled in its River Rouge complex both the gasoline-powered F-150 pickup trucks and all-electric F-150 Lightning pickup trucks. The price for the F-150 Lightning was thousands more than the price of the comparable gasoline-powered F-150.

Ford's managers face an important trade-off: Should the firm increase the resources—machinery, workers, and research and development work—devoted to the F-150 Lightning? Doing so might make it possible to lower the cost of producing it, allowing the firm to reduce the price while still earning a profit. Or should the firm devote those resources to the gasoline-powered F-150, its best-selling vehicle?

Bill Pugliano/Getty Images

One factor driving the demand for EVs is a federal tax credit enacted by President Joe Biden and Congress in August 2022. Depending on the buyer's income, the buyer receives a credit of up to $7,500 against their federal income taxes. To qualify for the full credit, however, the EV needs to meet two criteria. First, it must have a battery that is assembled in the United States or in a country with which the United States has a free trade agreement. Second, no more than 20 percent of the minerals used in the battery may be sourced from outside the United States.

In 2023, some of the batteries Ford was using in the F-150 Lightning were assembled in Hungary, and nearly all the batteries contained minerals from China. The United States doesn't have a free trade agreement with either of those countries. As a result, Ford managers face another trade-off: Should the firm invest resources to expand its battery production in the United States and pay the higher prices for minerals produced in the United States? Or should the company continue using some batteries assembled outside the United States or that contain minerals from China, which would mean lower sales because buyers would not be eligible for the full tax credit?

The federal government also faces a trade-off in offering the EV tax credit: The tax revenue it gives up as a result of the credit isn't available to fund other programs, including research on clean energy. As we will see, the ways that individuals, business managers, and government policymakers deal with trade-offs is an important part of economics.

AN INSIDE LOOK at the end of the chapter discusses how managers at Toyota and commercial truck manufacturer PACCAR evaluate the trade-offs in allocating resources between hydrogen- and electric-powered vehicles.

Chapter Outline & Learning Objectives

2.1 Production Possibilities Frontiers and Opportunity Costs, page 44
Use a production possibilities frontier to analyze opportunity costs and trade-offs.

2.2 Comparative Advantage and Trade, page 49
Describe comparative advantage and explain how it serves as the basis for trade.

2.3 The Market System, page 56
Explain the basics of how a market system works.

Economics in Your Life & Career

The Trade-offs When You Buy a Vehicle

Although the popularity of EVs is increasing, most people still buy conventional gasoline-powered vehicles. When you buy a gasoline-powered vehicle, you probably consider factors such as safety and fuel efficiency. To increase fuel efficiency, automobile manufacturers make some vehicles that are small and light. But people are usually safer driving large vehicles because they absorb more of the impact of an accident than do small vehicles. What do these facts tell us about the relationship between safety and fuel efficiency? If you were a manager at an automobile manufacturer, how might you evaluate the relationship between safety and fuel efficiency when designing vehicles? As you read the chapter, try to answer these questions. You can check your answers against those provided at the end of this chapter.

In a market system, managers are continually making decisions like those the managers at Ford make. These decisions reflect a key fact of economic life: *Scarcity requires trade-offs.* **Scarcity** exists because we have unlimited wants but limited resources available to fulfill those wants. Goods and services are scarce. So, too, are economic resources, or *factors of production*—workers, capital, natural resources, and entrepreneurial ability—that are used to make goods and services. Your time is scarce, which means you face trade-offs: If you spend an hour studying for an economics exam, you have one hour less to spend studying for a psychology exam or watching shows on Netflix. If your university decides to use some of its scarce budget to buy new computers for the computer labs, those funds will not be available to resurface the student parking lots or install an improved heating and air conditioning system in the dorms. If Ford decides to devote some of the scarce workers and machinery in its River Rouge production complex to producing more F-150 Lightnings, those resources will not be available to produce more of its gasoline-powered F-150s.

Scarcity A situation in which unlimited wants exceed the limited resources available to fulfill those wants.

Households and firms make many of their decisions in markets. Trade is a key activity that takes place in markets. Trade results from the decisions of millions of households and firms in markets around the world. By engaging in trade, people can raise their incomes. In this chapter, we provide an overview of how the market system coordinates the independent decisions of these millions of households and firms. We begin our analysis of the economic consequences of scarcity and how a market system works by introducing an important economic model: the *production possibilities frontier*.

2.1 Production Possibilities Frontiers and Opportunity Costs

LEARNING OBJECTIVE: Use a production possibilities frontier to analyze opportunity costs and trade-offs.

At its River Rouge production complex, Ford's resources—workers, machinery, materials, and entrepreneurial ability—are limited. As a result, the company faces a trade-off: Resources devoted to producing gasoline-powered vehicles are not available for producing EVs. Chapter 1 explained that economic models can be useful in analyzing many questions. We can use a simple model called a *production possibilities frontier* to analyze the trade-offs Ford faces in its River Rouge complex. A **production possibilities frontier (*PPF*)** is a curve showing the maximum attainable combinations of two goods that can be produced with available resources and current technology. In Ford's case, we are focusing on the trade-off the company faces between producing gasoline-powered F-150s and F-150 Lightnings. (For simplicity, we assume that Ford produces no other models at the River Rouge complex.)

Production possibilities frontier (*PPF*) A curve showing the maximum attainable combinations of two goods that can be produced with available resources and current technology.

Graphing the Production Possibilities Frontier

Figure 2.1 uses a production possibilities frontier to illustrate the key trade-off that Ford faces in producing F-150s. The numbers from the table are plotted in the graph. The line in the graph represents Ford's production possibilities frontier. If Ford uses all its resources in the plant to produce gasoline-powered F-150s, it can produce 80 per day—point *A* at one end of the production possibilities frontier. If Ford uses all its resources to produce F-150 Lightnings, it can produce 80 per day—point *E* at the other end. If Ford devotes resources to producing both gasoline-powered F-150s and Lightnings, it may reach a point like *B*, where it produces 60 of its gasoline-powered F-150s and 20 Lightnings.

All the combinations either on the frontier—like points *A*, *B*, *C*, *D*, and *E*—or inside the frontier—like point *F*—are *attainable* with the resources available. Combinations on the frontier are *efficient* because all available resources are being fully utilized, and

Ford's Production Choices

Choice	Quantity of Gasoline-Powered F-150s Produced per Day	Quantity of Lightnings Produced per Day
A	80	0
B	60	20
C	40	40
D	20	60
E	0	80

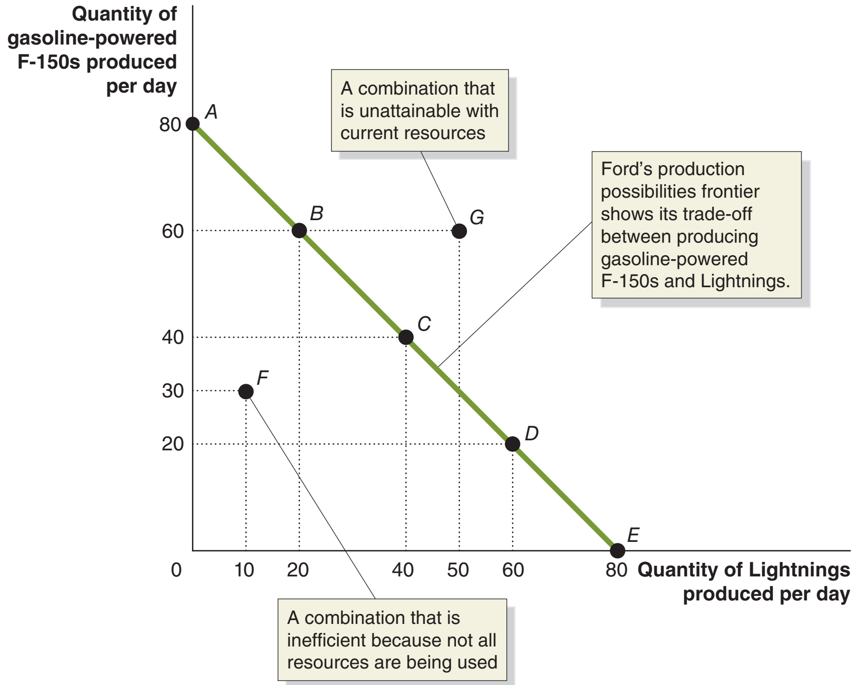


Figure 2.1

Ford's Production Possibilities Frontier

Ford faces a trade-off: To build one more gasoline-powered F-150, it must build one less Lightning. The production possibilities frontier illustrates the trade-off Ford faces. Combinations on the production possibilities frontier—like points *A*, *B*, *C*, *D*, and *E*—are *efficient* because the maximum output is being obtained from the available resources. Combinations inside the frontier—like point *F*—are *inefficient* because some resources are not being used. Combinations outside the frontier—like point *G*—are *unattainable* with current resources.

the fewest possible resources are being used to produce a given amount of output. Combinations inside the frontier—like point *F*—are *inefficient* because maximum output is not being obtained from the available resources—perhaps because the plant is not operating at full capacity. Ford might like to be beyond the frontier—at a point like *G*, where it would be producing 60 gasoline-powered F-150s and 50 Lightnings per day—but points beyond the production possibilities frontier are *unattainable*, given the firm's current resources. To produce the combination at *G*, Ford would need more machines and more workers.

Notice that if Ford is producing efficiently and is on the production possibilities frontier, the only way to produce one more Lightning is to produce one less gasoline-powered F-150. Recall from Chapter 1 that the **opportunity cost** of any activity is the highest-valued alternative that must be given up to engage in that activity. For Ford, the opportunity cost of producing one more Lightning is the number of gasoline-powered F-150s the company will not be able to produce because it has shifted those resources to producing the additional Lightnings. For example, if Ford moves from point *B* to point *C*, the opportunity cost of producing 20 more Lightnings per day is the 20 fewer gasoline-powered F-150s that it can produce.

Opportunity cost The highest-valued alternative that must be given up to engage in an activity.

What point on the production possibilities frontier is best? We can't tell without further information. As we saw in the chapter opener, Ford anticipates that the demand for Lightnings will increase, so the company is likely to choose a point closer to *E*. If Ford were more content to focus on producing gasoline-powered F-150s, the company would choose a point closer to *A*.

Solved Problem 2.1

Analyzing Trade-offs Using a Production Possibilities Frontier for Ford

Suppose, for simplicity, that during any given week, the machinery and number of workers at Ford's River Rouge complex cannot be increased. So, the number of gasoline-powered F-150s or Lightnings the company can produce during the week depends on how many hours workers devote to assembling each of the two models. Assume that Lightnings are more difficult to assemble. If Ford devotes an hour to assembling a gasoline-powered F-150, it will produce 15 pickups, but if Ford devotes an hour to producing Lightnings, it will produce only 10 pickups. Assume that the plant can run for 8 hours per day.

a. Use the information given to fill in the missing cells in the following table.

	Hours Spent Making		Quantity Produced per Day	
Choice	Gasoline-Powered F-150s	Lightnings	Gasoline-Powered F-150s	Lightnings
A	8	0		
B	7	1		
C	6	2		
D	5	3		
E	4	4		
F	3	5		
G	2	6		
H	1	7		
I	0	8		

b. Use the data in the table to draw a production possibilities frontier graph illustrating Ford's trade-off between assembling gasoline-powered F-150s and assembling Lightnings. Label the vertical axis "Quantity of gasoline-powered F-150s produced per day." Label the horizontal axis "Quantity of Lightnings produced per day." Make sure to label the values where Ford's production possibilities frontier intersects the vertical and horizontal axes.

c. Label the points representing choice *D* and choice *E*. If Ford is at choice *D*, what is its opportunity cost of making 10 more Lightnings?

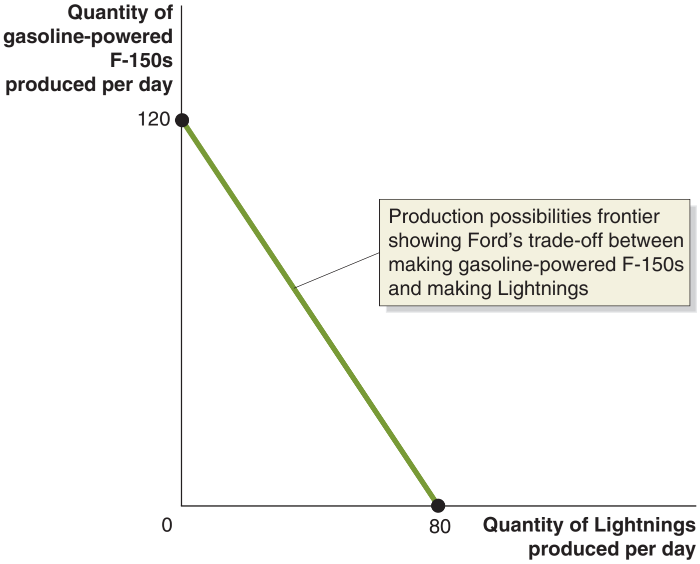
Solving the Problem

Step 1: Review the chapter material. This problem is about using production possibilities frontiers to analyze trade-offs, so you may want to review the section "Graphing the Production Possibilities Frontier."

Step 2: Answer part (a) by filling in the table. If Ford can assemble 15 gasoline-powered F-150s in 1 hour, then with choice *A*, it can assemble 120 gasoline-powered F-150s and 0 Lightnings. Because Ford can assemble 10 gasoline-powered F-150s in 1 hour, with choice *B*, it will produce 105 gasoline-powered F-150s and 10 Lightnings. Using similar reasoning, you can fill in the remaining cells in the table as follows:

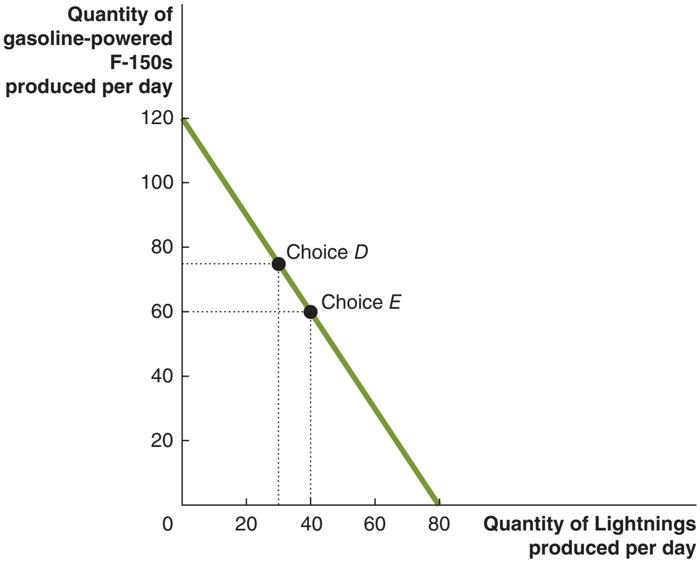
	Hours Spent Making		Quantity Produced per Day	
Choice	Gasoline-Powered F-150s	Lightnings	F-150s	Lightnings
A	8	0	120	0
B	7	1	105	10
C	6	2	90	20
D	5	3	75	30
E	4	4	60	40
F	3	5	45	50
G	2	6	30	60
H	1	7	15	70
I	0	8	0	80

Step 3: **Answer part (b) by drawing the production possibilities frontier graph.** Using the data from the table in step 2, you should draw a graph that looks like this:



If Ford devotes all 8 hours to assembling gasoline-powered F-150s, it will produce 120 of them. Therefore, Ford's production possibilities frontier will intersect the vertical axis at 120 gasoline-powered F-150s produced. If Ford devotes all 8 hours to assembling Lightnings, it will produce 80 of them. Therefore, Ford's production possibilities frontier will intersect the horizontal axis at 80 Lightnings produced.

Step 4: **Answer part (c) by labeling choices *D* and *E* on your graph.** The points for choices *D* and *E* can be plotted using the information from the table:



Moving from choice *D* to choice *E* increases Ford's production of Lightnings by 10 but lowers its production of gasoline-powered F-150s by 15. Therefore, Ford's opportunity cost of producing 10 more Lightnings is producing 15 fewer gasoline-powered F-150s.

Your Turn: For more practice, do related problem 1.11 at the end of this chapter.

Increasing Marginal Opportunity Costs

We can use the production possibilities frontier (*PPF*) to explore issues concerning the economy as a whole. Suppose we divide all the goods and services produced in the economy into just two types: military goods and civilian goods. In Figure 2.2, tanks represent military goods, and automobiles represent civilian goods. If all the country's resources are devoted to producing military goods, 400 tanks can be produced in one year. If all resources are devoted to producing civilian goods, 500 automobiles can be produced in one year. Devoting resources to producing both goods results in the economy being at other points along the *PPF*.

Notice that this *PPF* is bowed outward rather than being a straight line. Because the frontier is bowed out, the opportunity cost of automobiles in terms of tanks depends on where the economy currently is on the *PPF*. For example, to increase automobile production from 0 to 200—moving from point *A* to point *B*—the economy has to give up only 50 tanks. But to increase automobile production by another 200 vehicles—moving from point *B* to point *C*—the economy has to give up 150 tanks.

As the economy moves down the *PPF*, it experiences *increasing marginal opportunity costs* because increasing automobile production by a given quantity requires larger and larger decreases in tank production. Increasing marginal opportunity costs occur because some workers, machines, and other resources are better suited to one use than to another. At point *A*, some resources that are well suited to producing automobiles—such as workers who have years of experience on automobile assembly lines—are now producing tanks. Shifting these resources into producing automobiles by moving from point *A* to point *B* allows a substantial increase in automobile production without much loss of tank production. But as the economy moves down the *PPF*, more and more resources that are better suited to tank production are switched to automobile production. As a result, the increases in automobile production become increasingly smaller, while the decreases in tank production become increasingly larger. We would expect in most situations that *PPF*s will be bowed outward rather than linear, as we assumed in the Ford example discussed earlier.

The idea of increasing marginal opportunity costs illustrates an important economic concept: *The more resources already devoted to an activity, the smaller the payoff to devoting additional resources to that activity.* For example:

- The more hours you have already spent studying economics, the smaller the increase in your test grade from each additional hour you spend—and the greater the opportunity cost of using the hour in that way.
- The more funds a firm has devoted to research and development during a given year, the smaller the amount of useful knowledge it receives from each additional dollar spent—and the greater the opportunity cost of using the funds in that way.

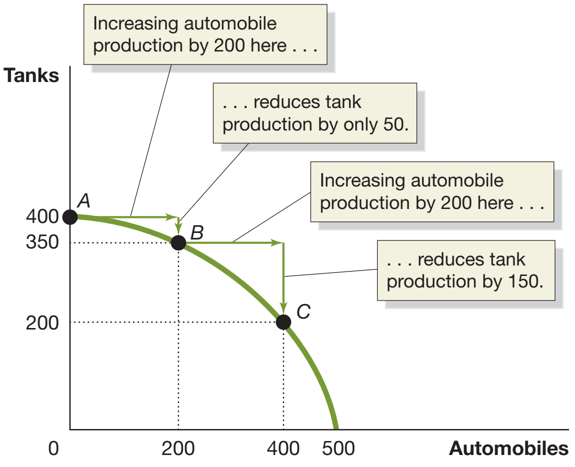
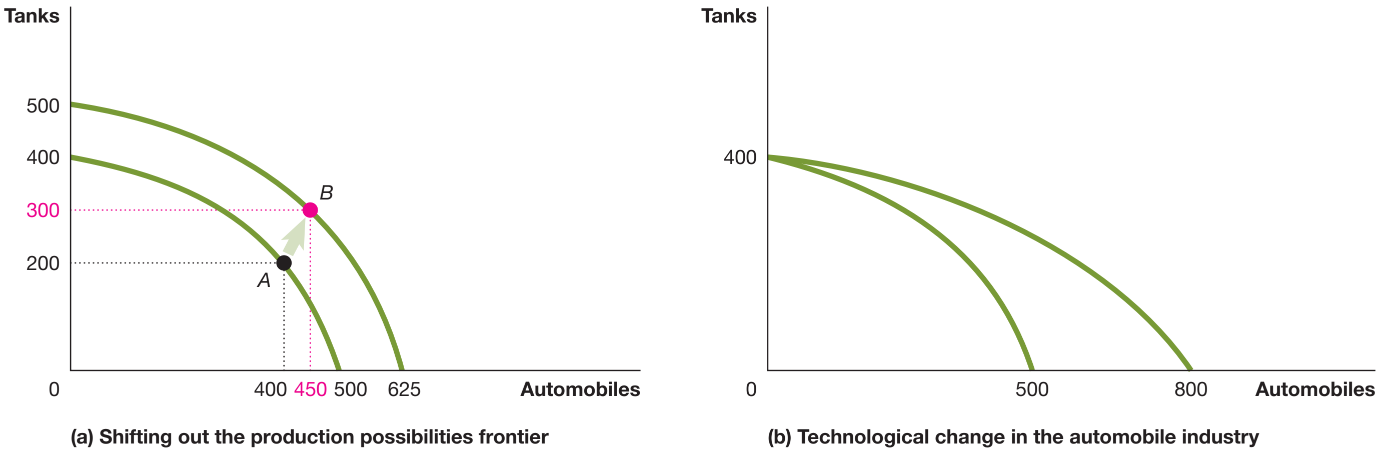


Figure 2.2

Increasing Marginal Opportunity Costs

As the economy moves down the production possibilities frontier, it experiences *increasing marginal opportunity costs* because increasing automobile production by a given quantity requires larger and larger decreases in tank production. For example, to increase automobile production from 0 to 200—moving from point *A* to point *B*—the economy has to give up only 50 tanks. But to increase automobile production by another 200 vehicles—moving from point *B* to point *C*—the economy has to give up 150 tanks.



(a) Shifting out the production possibilities frontier

(b) Technological change in the automobile industry

Figure 2.3 **Economic Growth**

Panel (a) shows that as more economic resources become available and technological change occurs, the economy can move from point *A* to point *B*, producing more tanks and more automobiles. Panel (b) shows the results of technological change in the automobile industry that increases the quantity of vehicles workers can produce per year while leaving unchanged the maximum quantity of tanks they can produce. Outward shifts in the production possibilities frontier represent *economic growth*.

- The more funds the federal government spends providing tax breaks to buyers of electric cars during a given year, the smaller the reduction in pollution from each additional dollar spent—and, once again, the greater the opportunity cost of using the funds in that way.

Economic Growth

At any given time, the total resources available to any economy are fixed. For example, if the United States produces more automobiles, it must produce less of something else—tanks in our example. The *capital stock* is the amount of machinery and other physical capital available in an economy. Over time, the resources available to an economy may increase because both the labor force and the capital stock increase. When the amount of resources increases, the economy's production possibilities frontier shifts outward, making it possible to produce both more automobiles and more tanks. Panel (a) of Figure 2.3 shows that, over time, the economy can move from point *A* to point *B*, producing more tanks and more automobiles.

Technological change makes it possible to produce more goods with the same number of workers and the same amount of machinery, which also shifts the *PPF* outward. Technological change may not affect all sectors equally. Panel (b) of Figure 2.3 shows the results of technological change in the automobile industry that increases the quantity of automobiles workers can produce per year while leaving unchanged the quantity of tanks they can produce.

Outward shifts in the *PPF* represent **economic growth** because they allow the economy to increase the production of goods and services, which ultimately raises the standard of living. In the United States and other high-income countries, the market system has aided the process of economic growth, which over the past 200 years has greatly increased the well-being of the average person.

Economic growth The ability of an economy to produce increasing quantities of goods and services.

2.2 Comparative Advantage and Trade

LEARNING OBJECTIVE: Describe comparative advantage and explain how it serves as the basis for trade.

We can use the concepts of the production possibilities frontier and opportunity cost to understand the basic economic activity *trade*. Markets are fundamentally about **trade**, which is the act of buying and selling. Sometimes we trade directly, as when children

Trade The act of buying and selling.

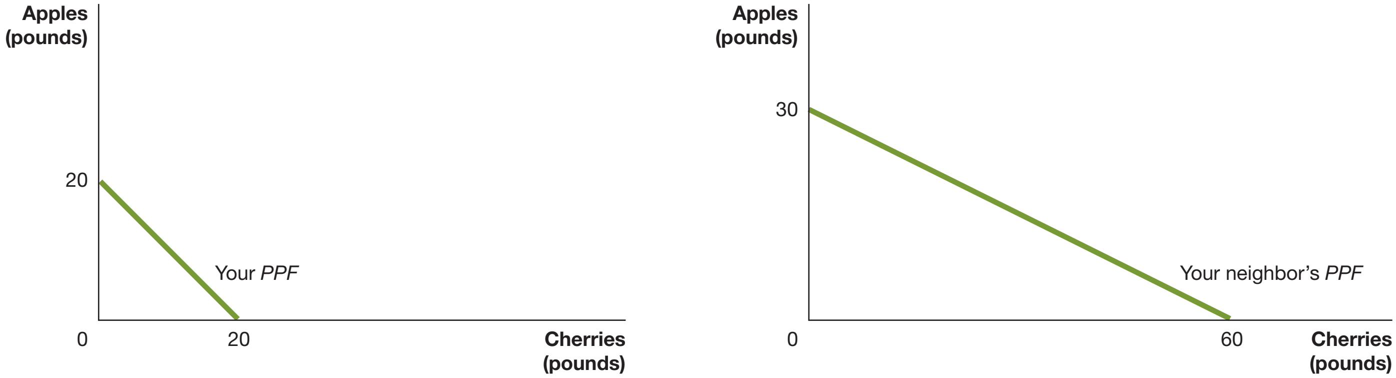
trade one Pokémon card for another one. But often we trade indirectly: We sell our labor services as, say, an accountant, a salesperson, or a nurse for money, and then we use the money earned to buy goods and services. Although in these cases trade takes place indirectly, ultimately the accountant, salesperson, or nurse is trading his or her services for food, clothing, and other goods and services. One of the great benefits of trade is that it makes it possible for people to become better off by increasing both their production and their consumption.

Specialization and Gains from Trade

Consider the following situation: You and your neighbor both have fruit trees on your properties. Initially, suppose you have only apple trees, and your neighbor has only cherry trees. In this situation, if you both like apples and cherries, there is an obvious opportunity for both of you to gain from trade: You trade some of your apples for some of your neighbor's cherries, and the trade makes you both better off. But what if there are apple and cherry trees growing on both of your properties? In that case, there can still be gains from trade. For example, your neighbor might be very good at picking apples, and you might be very good at picking cherries. It would make sense for your neighbor to concentrate on picking apples and for you to concentrate on picking cherries. You can then trade some of the cherries you pick for some of the apples your neighbor picks. But what if your neighbor is actually better at picking *both* apples and cherries than you are?

We can use production possibilities frontiers (*PPFs*) to show how your neighbor can benefit from trading with you *even though she is better than you are at picking both apples and cherries.* (For simplicity, and because it will not affect the conclusions we draw, we will assume that the *PPFs* in this example are straight lines.) The table in Figure 2.4 shows how many pounds of apples and how many pounds of cherries you and your neighbor can pick in one week. We can use the data in the table to construct *PPFs* for you and your neighbor. Panel (a) shows your *PPF*. If you devote all your time to picking apples, you can

	You		**Your Neighbor**	
	Apples	Cherries	Apples	Cherries
Devote all time to picking apples	20 pounds	0 pounds	30 pounds	0 pounds
Devote all time to picking cherries	0 pounds	20 pounds	0 pounds	60 pounds



(a) Your production possibilities frontier

(b) Your neighbor's production possibilities frontier

Figure 2.4 **Production Possibilities for You and Your Neighbor, without Trade**

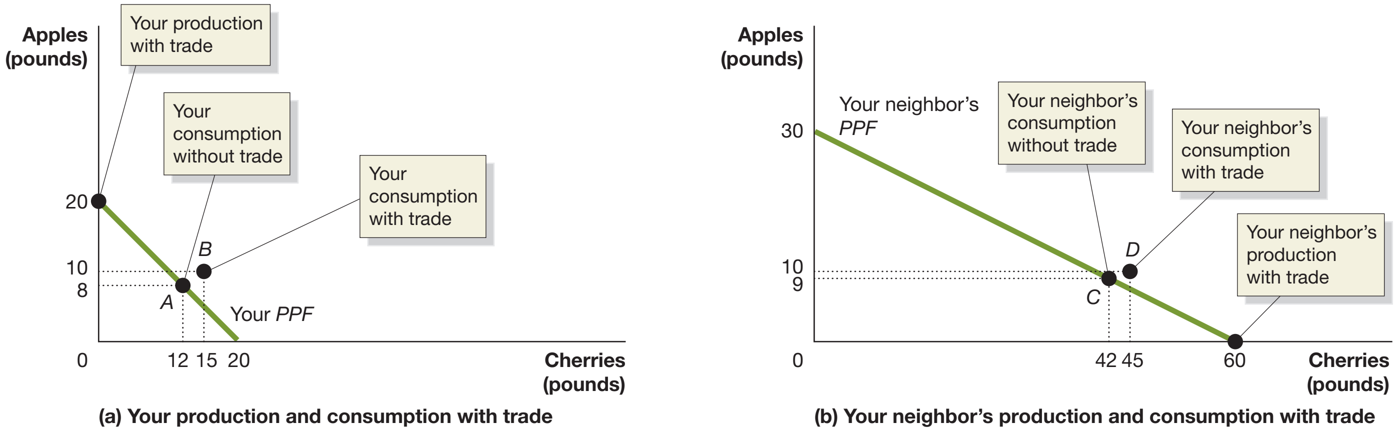
The table shows how many pounds of apples and how many pounds of cherries you and your neighbor can each pick in one week. We can use the data from the table to construct *PPFs* for you and your neighbor. Panel (a) shows your *PPF*. If you devote all your time to picking apples and none to picking cherries, you can pick 20 pounds. If you devote all your time to picking cherries, you can pick 20 pounds. Panel (b) shows that if your neighbor devotes all her time to picking apples, she can pick 30 pounds. If she devotes all her time to picking cherries, she can pick 60 pounds.

pick 20 pounds of apples per week. If you devote all your time to picking cherries, you can pick 20 pounds of cherries per week. Panel (b) shows that if your neighbor devotes all her time to picking apples, she can pick 30 pounds. If she devotes all her time to picking cherries, she can pick 60 pounds.

The *PPF*s in Figure 2.4 show the combinations of apples and cherries you and your neighbor can consume *without trade*. We can use Figure 2.5 to analyze how the situation changes if you and your neighbor decide to trade. Suppose that when you don't trade with your neighbor, you pick and consume 8 pounds of apples and 12 pounds of cherries per week. This combination of apples and cherries is represented by point *A* in panel (a) of Figure 2.5. When your neighbor doesn't trade with you, she picks and consumes 9 pounds of apples and 42 pounds of cherries per week. This combination of apples and cherries is represented by point *C* in panel (b).

After years in which you each pick and consume your own apples and cherries, suppose your neighbor makes the following proposal: Next week she will trade you 15 pounds of her cherries for 10 pounds of your apples. Should you accept this proposal? As we can see in Figure 2.5, you should accept because you will end up with more apples and more cherries to consume. To take advantage of her proposal, you should specialize in picking only apples rather than splitting your time between picking apples and picking cherries. We know specializing will allow you to pick 20 pounds of apples. You can trade 10 pounds of apples to your neighbor for 15 pounds of her cherries. The result is that you will be able to consume 10 pounds of apples and 15 pounds of cherries (point *B* in panel (a) of Figure 2.5). You are clearly better off as a result of trading with your neighbor: You can now consume 2 more pounds of apples and 3 more pounds of cherries than you were consuming without trading. You have moved beyond your *PPF*!

Your neighbor has also benefited from the trade. By specializing in picking only cherries, she can pick 60 pounds. She trades 15 pounds of cherries to you for 10 pounds of apples. She can then consume 10 pounds of apples and 45 pounds of cherries (point *D* in panel (b) of Figure 2.5). This combination is 1 more pound of apples and 3 more pounds of cherries than she was consuming before trading with you. She also has moved beyond her *PPF*. Table 2.1 summarizes the changes in production and consumption that result from your trade with your neighbor. (In this example, we chose one specific rate of trading cherries for apples—15 pounds of cherries for 10 pounds of apples. There are, however, many other rates of trading cherries for apples that would also make you and your neighbor better off.)



(a) Your production and consumption with trade

(b) Your neighbor's production and consumption with trade

Figure 2.5 **Gains from Trade**

When you don't trade with your neighbor, you pick and consume 8 pounds of apples and 12 pounds of cherries per week—point *A* in panel (a). When your neighbor doesn't trade with you, she picks and consumes 9 pounds of apples and 42 pounds of cherries per week—point *C* in panel (b). If you specialize in picking apples, you can pick 20 pounds. If your neighbor specializes in picking cherries, she can pick 60 pounds. If you trade 10 pounds of your apples for 15 pounds of your neighbor's cherries, you will be able to consume 10 pounds of apples and 15 pounds of cherries—point *B* in panel (a). Your neighbor can now consume 10 pounds of apples and 45 pounds of cherries—point *D* in panel (b). You and your neighbor are both better off as a result of the trade.

Table 2.1

A Summary of the Gains from Trade

	You		Your Neighbor	
	Apples (in pounds)	Cherries (in pounds)	Apples (in pounds)	Cherries (in pounds)
Production *and* consumption *without* trade	8	12	9	42
Production *with* trade	20	0	0	60
Consumption *with* trade	10	15	10	45
Gains from trade (increased consumption)	2	3	1	3

Absolute Advantage versus Comparative Advantage

Absolute advantage The ability of an individual, a firm, or a country to produce more of a good or service than competitors, using the same amount of resources.

It may be surprising that in the preceding example, your neighbor benefits from trading with you even though she is better than you at picking both apples and cherries. **Absolute advantage** is the ability of an individual, a firm, or a country to produce more of a good or service than competitors, using the same amount of resources. Your neighbor has an absolute advantage over you in picking both apples and cherries because she can pick more of each fruit than you can in the same amount of time. Although it seems that your neighbor should pick her own apples *and* her own cherries, we have just seen that she is better off specializing in picking cherries and leaving picking apples to you.

We can consider further why both you and your neighbor benefit from specializing in picking only one fruit. First, think about the opportunity cost to each of you of picking the two fruits. We saw from the *PPF* in Figure 2.4 that if you devoted all your time to picking apples, you would be able to pick 20 pounds of apples per week. As you move down your *PPF* and shift time away from picking apples to picking cherries, you have to give up 1 pound of apples for each pound of cherries you pick; the slope of your *PPF* is −1. (For a review of calculating slopes, see the appendix to Chapter 1.) Therefore, your opportunity cost of picking 1 pound of cherries is 1 pound of apples. By the same reasoning, your opportunity cost of picking 1 pound of apples is 1 pound of cherries. Your neighbor's *PPF* has a different slope, so she faces a different trade-off: As she shifts time from picking apples to picking cherries, she has to give up 0.5 pound of apples for every 1 pound of cherries she picks; the slope of your neighbor's *PPF* is −0.5. As she shifts time from picking cherries to picking apples, she gives up 2 pounds of cherries for every 1 pound of apples she picks. Therefore, her opportunity cost of picking 1 pound of apples is 2 pounds of cherries, and her opportunity cost of picking 1 pound of cherries is 0.5 pound of apples.

Comparative advantage The ability of an individual, a firm, or a country to produce a good or service at a lower opportunity cost than competitors.

Table 2.2 summarizes the opportunity costs for you and your neighbor of picking apples and cherries. Note that even though your neighbor can pick more apples in a week than you can, the *opportunity cost* of picking apples is higher for her than for you because when she picks apples, she gives up more cherries than you do. So, even though she has an absolute advantage over you in picking apples, it is more costly for her to pick apples than it is for you. The table also shows that her opportunity cost of picking cherries is lower than yours. **Comparative advantage** is the ability of an individual, a firm, or a country to produce a good or service at a lower opportunity cost than competitors. In picking apples, your neighbor has an *absolute advantage* over you, while you have a *comparative advantage* over her. Your neighbor has both an absolute advantage and a comparative advantage over you in picking cherries. As we have seen, you are better off specializing in picking apples, and your neighbor is better off specializing in picking cherries.

Table 2.2

Opportunity Costs of Picking Apples and Cherries

	Opportunity Cost of Picking 1 Pound of Apples	Opportunity Cost of Picking 1 Pound of Cherries
You	1 pound of cherries	1 pound of apples
Your neighbor	2 pounds of cherries	0.5 pound of apples

Comparative Advantage and the Gains from Trade

We have just arrived at an important economic principle: *The basis for trade is comparative advantage, not absolute advantage*. The fastest apple pickers do not necessarily do the most apple picking. If the fastest apple pickers have a comparative advantage in some other activity—picking cherries, playing professional football, or being industrial engineers—they are better off specializing in that activity. Individuals, firms, and countries are better off if they specialize in producing goods and services for which they have a comparative advantage and obtain the other goods and services they need by trading. We will return to the important concept of comparative advantage in Chapter 9, which is devoted to the subject of international trade.

Don't Let This Happen to You

Don't Confuse Absolute Advantage and Comparative Advantage

First, make sure you know the definitions:

- **Absolute advantage.** The ability of an individual, a firm, or a country to produce more of a good or service than competitors, using the same amount of resources. In our example, your neighbor has an absolute advantage over you in both picking apples and picking cherries.
- **Comparative advantage.** The ability of an individual, a firm, or a country to produce a good or service at a lower opportunity cost than competitors. In our example, your neighbor has a comparative advantage in picking cherries, but you have a comparative advantage in picking apples.

Keep these two key points in mind:

1. It is possible to have an absolute advantage in producing a good or service without having a comparative advantage. This is the case with your neighbor picking apples.
2. It is possible to have a comparative advantage in producing a good or service without having an absolute advantage. This is the case with your picking apples.

Your Turn: Test your understanding by doing related problem 2.7 at the end of this chapter.

Solved Problem 2.2

Comparative Advantage and the Gains from Trade

Suppose that Canada and the United States both produce maple syrup and honey, which are sold for the same price in both countries. These are the combinations of the two goods that each country can produce in a day, using the same amounts of capital and labor:

Canada		United States	
Honey (in tons)	Maple Syrup (in tons)	Honey (in tons)	Maple Syrup (in tons)
0	60	0	50
10	45	10	40
20	30	20	30
30	15	30	20
40	0	40	10
		50	0

a. Which country has a comparative advantage in producing maple syrup? Which country has a comparative advantage in producing honey?

b. Suppose that Canada is currently producing 30 tons of honey and 15 tons of maple syrup per day, and the United States is currently producing 10 tons of honey and 40 tons of maple syrup per day. Demonstrate that Canada and the United States can both be better off if they specialize in producing only one good and trade for the other.

c. Illustrate your answer to part (b) by drawing a *PPF* for Canada and a *PPF* for the United States. Show on your *PPF*s the combinations of honey and maple syrup produced and consumed in each country before and after trade.

Solving the Problem

Step 1: Review the chapter material. This problem is about comparative advantage, so you may want to review the section "Absolute Advantage versus Comparative Advantage."

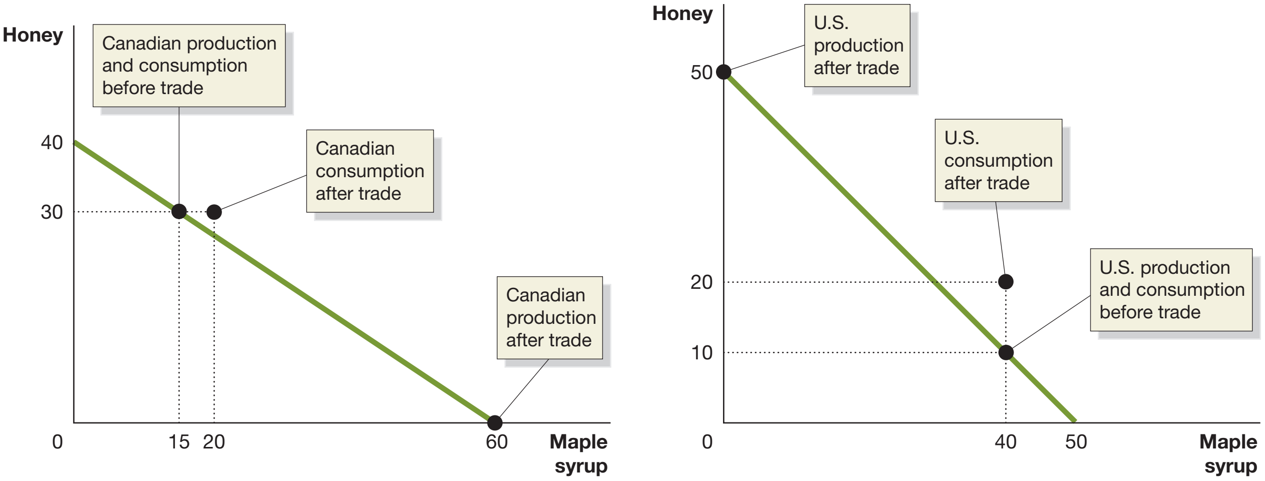
Step 2: Answer part (a) by determining which country has a comparative advantage in each activity. Remember that a country has a comparative advantage in producing a good if it can produce the good at the lowest opportunity cost. When Canada produces 1 more ton of honey, it produces 1.5 tons less of maple syrup. When the United States produces 1 more ton of honey, it produces 1 ton less of maple syrup. Therefore, for the United States, the opportunity cost of producing honey—1 ton of maple syrup—is lower than for Canada—1.5 tons of maple syrup. When Canada produces 1 more ton of maple syrup, it produces 0.67 ton less of honey. When the United States produces 1 more ton of maple syrup, it produces 1 ton less of honey. Therefore, Canada's opportunity cost of producing maple syrup—0.67 ton of honey—is lower than that of the United States—1 ton of honey. We can conclude that the United States has a comparative advantage in the production of honey, and Canada has a comparative advantage in the production of maple syrup.

Step 3: Answer part (b) by showing that specialization makes Canada and the United States better off. We know that Canada and the United States should each specialize where it has a comparative advantage. If both countries specialize, Canada will produce 60 tons of maple syrup and 0 tons of honey, and the United States will produce 0 tons of maple syrup and 50 tons of honey. After both countries specialize, the United States could then trade 30 tons of honey to Canada for 40 tons of maple syrup. (Other mutually beneficial trades are possible as well.) We can summarize the results in a table:

	Before Trade		After Trade	
	Honey (in tons)	Maple Syrup (in tons)	Honey (in tons)	Maple Syrup (in tons)
Canada	30	15	30	20
United States	10	40	20	40

The United States is better off after trade because it can consume the same amount of maple syrup and 10 more tons of honey. Canada is better off after trade because it can consume the same amount of honey and 5 more tons of maple syrup.

Step 4: Answer part (c) by drawing the *PPFs*.



(a) Canada's *PPF*

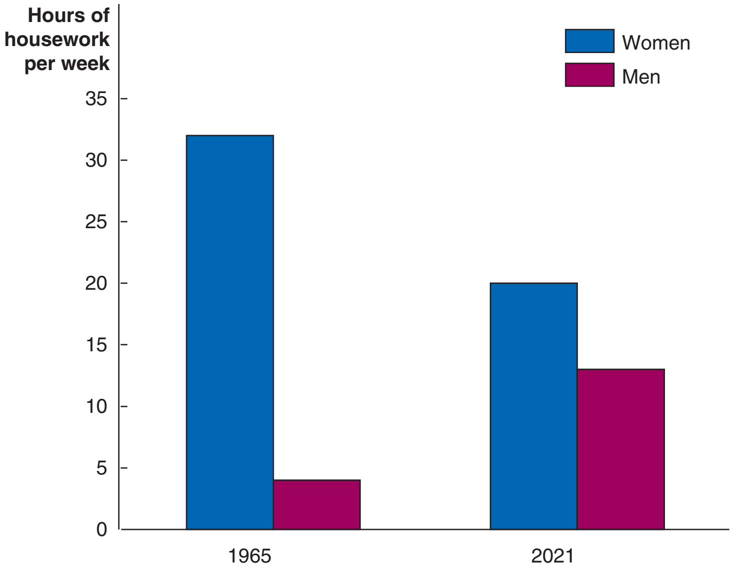
(b) The United States's *PPF*

Your Turn: For more practice, do related problems 2.8 and 2.9 at the end of this chapter.

Apply the Concept

Comparative Advantage, Opportunity Cost, and Housework

Among roommates, married couples, and other people living together, dividing up the household chores can be a source of stress. Traditionally, married women did much more housework, such as preparing meals, cleaning, and doing laundry, than did married men. As the following bar graph shows, in 1965, married women with children averaged about 32 hours of housework per week, while married men averaged only 4 hours. In 2021, married women averaged about 20 hours of housework, while married men averaged about 13 hours.



Chris Clinton/Photodisc/Getty Images

What's the most efficient way to divide up household chores?

Housework doesn't seem to be part of buying, selling, and the usual topics of business and economics. In fact, we can use basic economic concepts to analyze housework. Consider first the most efficient way to divide up household chores. Suppose Jack and Jill need to decide how they will get the cooking and laundry done. Assume that Jack has an absolute advantage over Jill in both chores, but he has a big advantage over Jill in cooking—he takes much less time to prepare very tasty meals—but is only a little faster than Jill in doing laundry. In other words, assuming that they have the same amount of time available to do housework, Jack has a comparative advantage in cooking, while Jill has a comparative advantage in doing laundry. So, rather than Jack and Jill both doing some of the cooking and some of the laundry, they would be better off if Jack follows his comparative advantage and does all the cooking, while Jill follows her comparative advantage and does all the laundry.

Economics can also provide some insight into the decline in the number of hours spent on housework since the 1960s. Combined, both men and women now spend fewer hours on housework. This decline has been partly driven by technology, particularly improvements in household appliances, such as dishwashers and microwave ovens. The decline in the number of hours women devote to housework also reflects the greater job opportunities available to women today than in the 1960s. The opportunity cost to a woman of spending time on housework and childcare is the wage she gives up by not spending that time in paid work. If a woman could work for an hour at a wage of $40 but spends that hour doing household chores, the opportunity cost of the time spent on chores is $40. As job opportunities for women and the wages those jobs pay have increased, so has the opportunity cost of doing housework. So, in addition to taking advantage of improved appliances, many families have found that the cost of hiring specialists in household chores, such as cleaning services and lawn care services, is lower than the opportunity cost of the wife (or husband) performing those chores.

As women's wages have risen relative to men's wages, the opportunity cost to women of doing housework has increased more than has the opportunity cost to men. So, we would expect that in addition to women devoting fewer hours to housework, the gap between the hours women and men devote would narrow. In fact, while women are devoting fewer hours to housework than they did in 1965, they now average more than twice as many hours of paid work: an average of 20 hours per week in 2021 compared with an average of only 8 hours per week in 1965.

Of course, changes in social attitudes also help explain changes in how men and women allocate their time. But we have seen that the basic economic concepts of comparative advantage and opportunity cost provide important insights into the not-so-wonderful world of household chores.

Your Turn: Test your understanding by doing related problem 2.16 at the end of this chapter.

2.3 The Market System

LEARNING OBJECTIVE: Explain the basics of how a market system works.

We have seen that households, firms, and the government face trade-offs and incur opportunity costs because resources are scarce. We have also seen that trade allows people to specialize according to their comparative advantage. By engaging in trade, people can raise their incomes and their standard of living. Of course, trade in the modern world is much more complex than the examples we have considered so far. Trade today involves the decisions of millions of people around the world. How are all of these decisions coordinated? In the United States and most other countries, trade is carried out in markets. Markets also determine the answers to the three fundamental questions discussed in Chapter 1:

1. What goods and services will be produced?
2. How will the goods and services be produced?
3. Who will receive the goods and services produced?

Market A group of buyers and sellers of a good or service and the institution or arrangement by which they come together to trade.

Product market A market for goods—such as computers—or services—such as medical treatment.

Factor market A market for the factors of production, such as labor, capital, natural resources, and entrepreneurial ability.

Factors of production Labor, capital, natural resources, and other inputs used to make goods and services.

Recall that a **market** is a group of buyers and sellers of a good or service and the institution or arrangement by which they come together to trade. Markets take many forms: They can be physical places, such as the pizza parlors in your city or the New York Stock Exchange, or virtual places, such as eBay. In a market, the buyers are demanders of goods or services, and the sellers are suppliers of goods or services. Households and firms interact in two types of markets: product markets and factor markets. **Product markets** are markets for goods—such as smartphones—and services—such as medical treatment. In product markets, households are demanders, and firms are suppliers. **Factor markets** are markets for the *factors of production*. **Factors of production** are the inputs used to make goods and services. Factors of production are divided into four broad categories:

1. *Labor* includes all types of work, from the part-time labor of teenagers working at McDonald's to the work of senior managers at Ford.
2. *Capital* refers to physical assets, such as computers, office buildings, and machine tools, as well as intellectual property, such as computer software or the formula for a vaccine, used to produce other goods.
3. *Natural resources* include land, water, oil, iron ore, and other raw materials (or "gifts of nature") that are used in producing goods.
4. An *entrepreneur* is someone who operates a business. *Entrepreneurial ability* is the ability to bring together the other factors of production to successfully produce and sell goods and services.

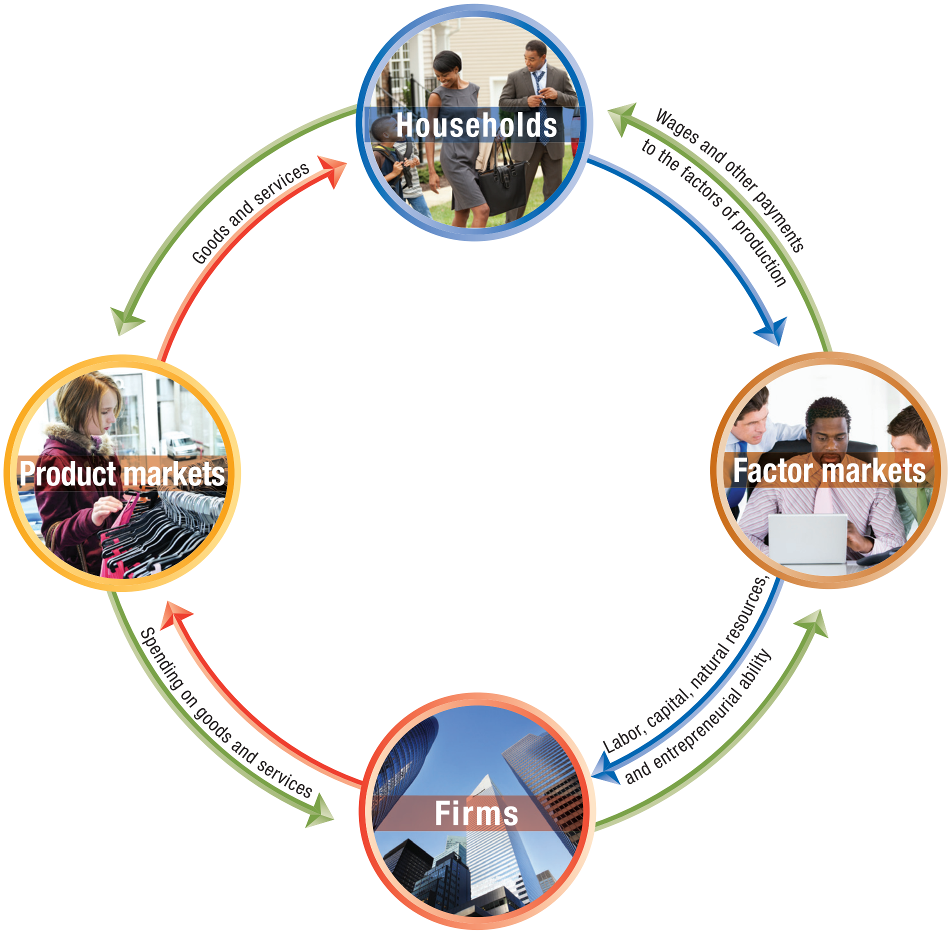
The Circular Flow of Income

Two key groups participate in markets:

1. *Households* are all the individuals in a home. A household may consist of one person or several persons. Households are suppliers of factors of production—particularly labor—employed by firms to make goods and services. Households use the income they receive from selling the factors of production to purchase the goods and services supplied by firms. We are familiar with households as suppliers of labor because most people earn most of their income by going to work, meaning they are selling their labor services to firms in the labor market. But households own the other factors of production as well, either directly or indirectly, by owning the firms that own these resources. All firms are owned by households. A small firm, such as a neighborhood restaurant, might be owned by one person. A large firm, such as Apple, is owned by millions of households that buy shares of stock in it. When firms pay profits to the people who own them, the firms are paying for using the capital and natural resources that are supplied to them by those owners. So, we can generalize by saying that in factor markets, households are suppliers, and firms are demanders.
2. *Firms* are suppliers of goods and services. Firms use the funds they receive from selling goods and services to buy or hire the factors of production needed to make the goods and services.

We can use a simple economic model called the **circular-flow diagram** to see how participants in markets are linked. Figure 2.6 shows that in factor markets, households supply labor and other factors of production in exchange for wages and other payments from firms. In product markets, households use the payments they earn in factor markets to purchase the goods and services supplied by firms. Firms produce these goods and

Circular-flow diagram A model that illustrates how participants in markets are linked.


Households
Goods and services
Wages and other payments to the factors of production
Product markets
Factor markets
Spending on goods and services
Labor, capital, natural resources, and entrepreneurial ability
Firms

top: Ariel Skelley/Digital Vision/Getty images; left: Elena Elisseeva/Shutterstock; right: Stockbroker/MBI/Alamy Stock Photo; bottom: Mikael Damkier/Shutterstock

Figure 2.6

The Circular-Flow Diagram

Households and firms are linked together in a circular flow of production, income, and spending. The blue arrows show the flow of the factors of production. In factor markets, households supply labor, entrepreneurial ability, and other factors of production to firms. Firms use these factors of production to make goods and services that they supply to households in product markets. The red arrows show the flow of goods and services from firms to households. The green arrows show the flow of funds. In factor markets, households receive wages and other payments from firms in exchange for supplying the factors of production. Households use these wages and other payments to purchase goods and services from firms in product markets. Firms sell goods and services to households in product markets, and they use the funds to purchase the factors of production from households in factor markets.

services using the factors of production supplied by households. In the figure, the blue arrows show the flow of factors of production from households through factor markets to firms. The red arrows show the flow of goods and services from firms through product markets to households. The green arrows show the flow of funds from firms through factor markets to households and the flow of spending from households through product markets to firms.

Like all other economic models, the circular-flow diagram is a simplified version of reality. Figure 2.6 leaves out (1) the role of government, (2) the role of the *financial system*, including banks, and (3) the role of international trade. We will cover these aspects of the circular flow in later chapters. Despite these simplifications, the circular-flow diagram in Figure 2.6 helps us see how product markets, factor markets, and their participants are linked together. One of the great wonders of the market system is that it manages to successfully coordinate the independent activities of so many households and firms.

The Gains from Free Markets

Free market A market with few government restrictions on how a good or service can be produced or sold or on how a factor of production can be employed.

A **free market** exists when the government places few restrictions on how goods and services can be produced or sold or on how factors of production can be employed. Governments in all modern economies intervene more than is consistent with a fully free market. In that sense, we can think of the free market as a benchmark against which we can judge actual economies. There are relatively few government restrictions on economic activities in the United States, Canada, the countries of Western Europe, Hong Kong, Singapore, and South Korea. So, these countries come close to the free market benchmark. In countries such as Cuba, Venezuela, and North Korea, the free market system has been rejected in favor of centrally planned economies with extensive government control over product and factor markets. Countries that come closest to the free market benchmark have been more successful than countries with centrally planned economies in providing their people with rising living standards.

The Scottish philosopher Adam Smith is considered the father of modern economics because his book *An Inquiry into the Nature and Causes of the Wealth of Nations*, published in 1776, was an early and very influential argument for the free market system. Smith was writing at a time when extensive government restrictions on markets were common. In many parts of Europe, the *guild system* prevailed. Under this system, governments would give guilds, or organizations of producers, the authority to control the production of a good. For example, the shoemakers' guild controlled who was allowed to produce shoes, how many shoes they could produce, and what price they could charge. In France, the cloth makers' guild even dictated the number of threads in the weave of the cloth.

Smith argued that such restrictions reduced the income and wealth of a country and its people by restricting the quantity of goods produced. Some people at the time supported the restrictions of the guild system because it was in their financial interest to do so. If you were a member of a guild, the restrictions served to reduce the competition you faced. But other people believed that the alternative to the guild system was economic disorder. Smith argued that these people were wrong and that a country could enjoy a smoothly functioning economic system if firms were freed from restrictions placed on their operations either by guilds or directly by governments.

Claudine Klodien/Alamy Stock Photo

This statue of Adam Smith, the father of modern economics, is located in the Royal Mile market square in Edinburgh, Scotland, in front of Saint Giles Cathedral.

The Market Mechanism

In Smith's day, defenders of restrictions on how firms operate argued that if, for example, the shoemakers' guild did not control shoe production, either too many or too few shoes would be produced. In contrast, Smith maintained that prices would do a better job of coordinating the activities of buyers and sellers than the guilds could. A key to understanding Smith's argument is the assumption that *individuals usually act in a rational, self-interested way*. In particular, individuals take the actions that are most likely to make themselves better off financially. This assumption of rational, self-interested behavior underlies nearly all economic analysis. In fact, economics can be distinguished from other disciplines that study human behavior—such as sociology and psychology—by its emphasis on the assumption of self-interested behavior. Adam Smith understood—as economists today understand—that people's motives can be complex. But when we analyze people in the act of buying and selling, the motivation of financial reward usually provides the best explanation for the actions people take.

For example, suppose that a significant number of consumers switch from buying conventional gasoline-powered cars to buying electric cars, such as the Ford F-150 Lightning. Firms will find that they can charge relatively higher prices for electric cars than they can for gasoline-powered cars. The self-interest of these firms will lead them to respond to consumers' wishes by producing more electric cars and fewer gasoline-powered cars. Or suppose that consumers decide that they want to eat less food containing gluten. Then the prices firms can charge for gluten-free bread and pasta will increase. The self-interest of firms will lead them to produce more of those foods and less regular bread and pasta, which, in fact, is what has happened over the past 10 years.

Note that for the market mechanism to work in response to changes in consumers' wants, *prices must be flexible*. The *relative price* is the price of one good or service relative to the prices of other goods or services. Changes in relative prices provide information, or a signal, to both consumers and firms. For example:

- Consumers worldwide have increased their demand for cattle and poultry. Because corn is fed to cattle and poultry, prices for corn have increased relative to prices for other crops. Many farmers in the United States received this price signal and responded by increasing the amount of corn they planted and decreasing the amount of soybeans and wheat. One Kansas farmer was quoted as saying, "It seemed to me there was $100 to $150 per acre more money in the corn than there was in the beans. That's the kind of math that a lot of guys were using." In 2022, the U.S. corn crop was 30 percent larger than it was in 2012.
- Falling prices for DVDs and music CDs in the late 1990s and early 2000s were a signal to movie studios and record companies to devote fewer resources to these products and more resources to making movies and music available to stream online.

In the United States today, governments at the federal, state, and local levels set or regulate the prices of only about 10 to 20 percent of goods and services. The prices of other goods and services are free to adjust as consumer preferences change and as costs of production change.

In the case where consumers want more of a product, and in the case where they want less of a product, the market system responds without a guild or the government giving orders about how much to produce or what price to charge. Economists have used Adam Smith's metaphor of the *invisible hand* to describe how the market leads firms to provide consumers with the goods they want:

> It is not from the benevolence of the butcher, the brewer, or the baker, that we expect our dinner, but from their regard to their own interest. . . . [The businessman] intends only his own gain, and he is in this . . . led by an invisible hand to promote an end which was no part of his intention.

Firms respond *individually* to changes in prices by making decisions that *collectively* end up satisfying the preferences of consumers.

How the Market Mobilizes Knowledge

The smooth and efficient functioning of an economy requires the processing of enormous amounts of knowledge or information. Some of the information is technical, such as the chemical formula for a prescription drug or the physics and engineering knowledge embodied in a basic computer chip. Some of this knowledge may have been widely available to the public for many years.

But there is also both technical and nontechnical knowledge that is not widely available, including these business examples:

- How to adapt a vaccine to be effective against a mutated version of a disease
- How to adapt the operation of a restaurant to deal with a shortage of workers
- How to modify a car dealer's service department to deal with an increase in EVs purchased by the dealer's customers
- How to change the mix of products for sale in a store as the number of people working in nearby office buildings declines
- What robot is needed on a car assembly line to increase the output of EVs per day

There are three points to note about this knowledge:

1. It's local. That is, it's known by only a few people or perhaps only a single person.
2. The knowledge concerns the best way to respond to *changes* a firm is facing in its ability to make or sell products or *changes* the firm could make that would improve its ability to make or sell its product.
3. The economy needs to use this knowledge to provide the most efficient answers to the three fundamental questions we listed at the beginning of this section (What goods and services will be produced? How will the goods and services be produced? Who will receive the goods and services produced?).

In the 1940s, Nobel Laureate Friedrich Hayek was the first economist to emphasize how a market system does a better job using knowledge than does a government-run, centrally planned economy. A central planner in, say, North Korea or in the former Soviet Union would have access to generally available knowledge, such as the formula for existing prescription drugs or the capabilities of existing machinery. But that central planner lacks the knowledge of the best way to *adapt to changing conditions*.

Consider the first two examples listed above:

- *Firms adapting a vaccine to be effective following a virus mutating*. If a virus mutates in a way that makes an existing vaccine ineffective, those firms that have the best ideas and the labs best suited to this research will be the ones most likely to develop a new vaccine to address the mutation. The planner, lacking this knowledge, may allocate resources to firms that are not well equipped to develop the new vaccine.
- *Restaurants adapting to a labor shortage*. When a labor shortage affects the restaurant industry, restaurants that serve meals primarily to people working in the neighborhood know that these customers face time constraints. Some restaurants would prefer that the available workers be assigned to cook and prepare food, even if doing so means the customers must, at the end of a meal, place their dishes in a designated area. Restaurants that serve more meals to tourists or to retired people, who are less time constrained, will assign more workers to clearing tables, even if it means that meals are served more slowly. This knowledge is readily available to local restaurant managers but not to government planners who are unfamiliar with the preferences of local consumers.

A market system mobilizes knowledge through competition. For instance, competition among pharmaceutical firms is the best way to mobilize the knowledge of firms and university research labs that's relevant to producing a new vaccine. Pharmaceutical firms have a strong incentive to bring a new vaccine to market so as to increase their profits. Similarly, competition among restaurants will result in their adapting to a labor shortage in a way that best suits the preferences of their customers. Restaurants that fail to adapt by, for instance, serving food too slowly to meet the need of their customers, lose customers to restaurants that better adapt.

The ability to mobilize knowledge is a key way the market system provides better economic outcomes, including a higher standard of living, than does government central planning. As the following *Apply the Concept* illustrates, the market system can facilitate the manufacturing of even complex products containing many components embodying the latest technologies from firms located around the world.

Apply the Concept

A Story of the Market System in Action: How Do You Make an iPad?

Apple produces the iPad. Because Apple's headquarters is in Cupertino, California, it seems reasonable to assume that iPads are also manufactured in that state. A poll by the *New York Times* showed that, in fact, a majority of people interviewed believed that iPads are manufactured in the United States, if not specifically in California. Although engineers at Apple designed the iPad, the company produces none of the components of the iPad, and it doesn't assemble the components into finished products. Far from being produced entirely by one company in one country, the iPad requires the coordinated activities of thousands of workers and dozens of firms spread around the world.

Foxconn, which is based in Taiwan, assembles most iPads in factories in China and ships them to Apple for sale in the United States. Pegatron, another Taiwanese firm with factories in China, also assembles some iPads. Although Foxconn and Pegatron do the final assembly, they don't make any of the components and, in fact, charge Apple only about $6 for assembling each iPad.

Multiple firms can supply a particular component for an iPad model. The following table lists just *some* of the firms that have supplied Apple with iPad components.

Qilai Shen/Bloomberg/Getty Images

The market coordinates the activities of many people spread around the world who contribute to making an iPad.

Firm	Location of the Firm	iPad Component Supplied
AKM	Japan	Motion sensor
AU Optronics	Taiwan	Display
Avago Technologies	United States (Pennsylvania)	Wireless technology
Bosch Sensortec	Germany	Accelerometer
Broadcom	United States (California)	Touchscreen controller and wireless chip
Cirrus Logic	United States (Texas)	Audio chip
Corning	United States (New York)	Glass screen cover
Dialog Semiconductor	Germany	Power management chip
Elpida	United States (Idaho)	System memory
Infineon Technologies	Germany	Semiconductors
LG Electronics	South Korea	Display
NXP	Netherlands	NFC controller
Parade Technologies	Taiwan	Timing controller
Qualcomm	United Kingdom	Wireless section
Samsung	South Korea	Display, flash memory, and applications processor
Sharp	Japan	Display
Skyworks Solutions	United States (Massachusetts)	Wireless technology
STMicroelectronics	France/Italy	Motion sensors
Texas Instruments	United States (Texas)	Touchscreen controller
Toshiba	Japan	Flash memory

But even more firms are involved because each of these suppliers in turn relies on its own suppliers. For example, Broadcom designs the touchscreen controller for the iPad and supplies it to Apple, but it does not manufacture the components of the controller or assemble them. To manufacture the components, Broadcom relies on SilTerra, based in Malaysia; SMIC, based in mainland China; and Taiwan Semiconductor Manufacturing Corporation (TSMC) and UMC, based in Taiwan. TSMC's factories are for the most part not in Taiwan but in mainland China and Eastern Europe. (As we noted in the opener to Chapter 1, in 2022, Congress passed the Chips and Science Act, which provided subsidies for firms to establish semiconductor factories in the United States. Apple indicated that it would begin buying semiconductors from TSMC's new factory in Arizona.) To assemble the components, Broadcom uses several companies, including Amkor Technology, based in Chandler, Arizona, and STATS ChipPAC, based in Singapore.

All told, an iPad contains hundreds of parts that are designed, manufactured, and assembled by firms around the world. Many of these firms are not even aware of which other firms are also producing components for the iPad. Few of the managers of these firms have met managers of the other firms or shared knowledge of how their particular components are produced. In fact, no one person—from Tim Cook, the chief executive officer of Apple, on down—possesses the knowledge of how to produce all the components that are assembled into an iPad. Instead, the invisible hand of the market has led these firms to contribute their knowledge and resources to the process that ultimately results in an iPad available for sale in a store in the United States.

Your Turn: Test your understanding by doing related problems 3.9 and 3.10 at the end of this chapter.

The Role of the Entrepreneur in the Market System

Entrepreneur Someone who operates a business, bringing together the factors of production—labor, capital, and natural resources—to produce goods or services.

Entrepreneurs are central to a market system. An **entrepreneur** is someone who operates a business. Entrepreneurs first determine what goods and services they believe consumers want and then decide how to produce those goods and services most profitably, using the available factors of production—labor, capital, and natural resources. Successful entrepreneurs effectively search out opportunities to provide new goods and services. New technology frequently creates these opportunities. Consumers and existing businesses often do not at first realize that the new technology makes new products feasible. For example, even after the development of the internal combustion engine had made automobiles feasible, Henry Ford remarked: "If I had asked my customers what they wanted, they would have said a faster horse." Because consumers often cannot evaluate a new product before it exists, some of the most successful entrepreneurs, such as the late Steve Jobs of Apple, rarely use *focus groups*, or meetings with consumers in which the consumers are asked what new products they would like to see. Instead, *entrepreneurs think of products that consumers may not even realize they need* (in Jobs's case, an MP3 player—the iPod—or a tablet computer—the iPad). Entrepreneurs are important to the economy because they are often responsible for making new products widely available to consumers, as Henry Ford did with the automobile and Steve Jobs did with the iPod.

The firms that entrepreneurs found are typically small at first, as Apple and Ford were. Entrepreneurs put their own funds at risk when they start businesses. If they are wrong about what consumers want or about the best way to produce goods and services, they can lose those funds. In fact, it is not unusual for entrepreneurs who eventually achieve great success to fail at first. For instance, early in their careers, both Henry Ford and Sakichi Toyoda, who eventually founded the Toyota Motor Corporation, started companies that quickly failed.

Few entrepreneurs become billionaires like Jeff Bezos (founder of Amazon), Janice Bryant Howroyd (founder of the personnel firm The ActOne Group), Sara Blakely (founder of apparel maker Spanx), Bill Gates (cofounder of Microsoft), or Judy Faulkner (founder of Epic Systems, the leading provider of medical records software). In fact, research by Richard Freeman of Harvard University has shown that a typical entrepreneur earns less than an employee at a large firm who has the same education and other characteristics. Nevertheless, every year thousands of people who value being their own boss, who believe they have an idea for a new good or service, or who believe they can make a much higher income by owning a business than by working for someone else open new businesses.

Entrepreneurs make vital contributions to economic growth through their roles in responding to consumer wants and introducing new products. Government policies that encourage entrepreneurship are also likely to increase economic growth and raise the standard of living. In the next section, we consider the legal framework required for entrepreneurs to succeed.

The Legal Basis of a Successful Market System

In a free market, the government does not restrict how firms produce and sell goods and services or how they employ factors of production. But the absence of such government restrictions is not enough for the market system to succeed in providing people with a high standard of living. Government has to take active steps to provide a *legal environment* that will allow markets to operate efficiently.

Protection of Private Property For the market system to work well, individuals must be willing to take risks. Someone with $250,000 can be cautious and keep it safely in a bank—or even in cash, if the person doesn't trust banks. But the market system won't work unless a significant number of people are willing to risk their funds by investing them in businesses. Investing in businesses is risky in any country. Many businesses fail every year in high-income countries such as the United States. But in high-income countries, someone who starts a new business or invests in an existing business doesn't have to worry that the government, the military, or criminal gangs might decide to seize the business or demand payments for not destroying it. Unfortunately, in many low-income countries, business owners are not well protected from having their businesses seized by the government or from having their profits taken by criminals. Where these problems exist, opening a business can be extremely risky. Cash can be concealed easily, but a business is difficult to conceal or move.

Property rights are the rights individuals or businesses have to the exclusive use of their property, including the right to buy or sell it. Property can be physical property, such as a store or factory. Property can also be intangible, such as the right to an idea. Two amendments to the U.S. Constitution guarantee property rights: The Fifth Amendment states that the federal government shall not deprive any person "of life, liberty, or property, without due process of law." The Fourteenth Amendment extends this guarantee to the actions of state governments: "No state . . . shall deprive any person of life, liberty, or property, without due process of law." Similar guarantees exist in every high-income country. Unfortunately, in many developing countries, such guarantees do not exist or are poorly enforced.

Property rights The rights individuals or businesses have to the exclusive use of their property, including the right to buy or sell it.

In any modern economy, *intellectual property rights* are very important. Intellectual property includes books, films, software, and ideas for new products or new ways of producing products. To protect intellectual property, the federal government grants a *patent* that gives an inventor—often a firm—the exclusive right to produce and sell a new product for a period of 20 years from the date the patent was filed. For instance, because Ford has a patent on the way the battery is integrated into the frame of its F-150 Lightning pickups, other firms cannot sell EVs that use the same method. The government grants patents to encourage firms to spend money on the research and development necessary to create new products or improvements to existing products. If other companies could freely use Ford's new method of integrating batteries into vehicle frames, Ford would have been less likely to develop it. Just as a new product or a new method of making a product receives patent protection, new books, films, and software receive *copyright* protection. Under U.S. law, the creator of a book, film, or piece of music has the exclusive right to use the creation during the creator's lifetime. The creator's heirs retain this exclusive right for 70 years after the death of the creator.

In providing copyright protection for only a limited time, Congress provides economic incentives to creators while eventually—after the period of copyright has ended—allowing the creators' works to be freely available to others. The longer the period of copyright, the longer the creator (or the creator's family) can restrict others from using the work.

Enforcement of Contracts and Property Rights Business activity often involves someone agreeing to carry out some action in the future. For example, you might borrow $30,000 to buy an EV and promise the bank—by signing a loan contract—that you will pay back the money over the next five years. Or Apple might sign a licensing agreement with a small technology company, agreeing to use that company's technology for a period of several years in return for a fee. These agreements usually take the form of legal contracts. For the market system to work, businesses and individuals have to rely on these contracts being carried out. If one party to a legal contract does not fulfill its obligations—perhaps a small company that promised Apple exclusive use of its technology begins licensing it to other companies—the other party can go to court to have the agreement enforced. Similarly, if you believe that the federal or state government has violated your property rights under the Fifth or Fourteenth Amendments, you can go to court to have your rights enforced.

But going to court to enforce a contract or property rights will be successful only if the court system is independent and judges are able to make impartial decisions on the basis of the law. In high-income countries such as the United States, the court systems are able to make their decisions based on the law because they have enough independence from other parts of the government and enough protection from intimidation by outside forces—such as criminal gangs. In many developing countries, the court systems lack this independence and will not provide a remedy if the government violates property rights or if a person with powerful political connections decides to violate a business contract.

If property rights are not well enforced, fewer goods and services will be produced. This reduces economic efficiency, leaving the economy inside its production possibilities frontier.

Apply the Concept

What Is Socialism?

For the past 200 years, the main alternative to the market system has been socialism. But what is socialism? One influential version of socialism is associated with the writings of the German philosopher and economist Karl Marx. In his book *Das Kapital*, the first volume of which was published in 1867, Marx argued that the market system, or *capitalism*, would eventually be replaced by a communist economy in which workers would control production. Communist revolutions in Russia in 1917 and China in 1949 brought to power governments that claimed to be implementing Marx's ideas. As we saw in Chapter 1, Section 1.2, however, these countries became centrally planned economies, with the Communist Party, rather than workers, in control.

Centrally planned economies eliminated the market mechanism in favor of government bureaucrats allocating resources. They also greatly reduced property rights and left no role for individual entrepreneurs. As a result, these economies were neither allocatively nor productively efficient (see Chapter 1, Section 1.2), and they were unable to deliver a high standard of living to their populations. These countries were also political dictatorships. Today, only North Korea and Cuba are socialist in the Marxist sense. Both Russia and China now allow private businesses to operate and rely on the market to allocate resources, although in both countries the government plays a larger role in the economy than it does in the United States.

GREEN NEW DEAL
END POVERTY
IMMIGRANTS RIGHTS

Lev Radin/Shutterstock

Some politicians, such as Congresswoman Alexandria Ocasio-Cortez, support a larger role for government in the economy.

After the end of World War II in 1945, *social democratic parties* came to power in some Western European countries. Although their economic programs differed, they typically favored a large role for the government in the economy, including government ownership, or *nationalization*, of certain large industries. For instance, after coming to power in 1945, the British Labour Party nationalized the coal and iron and steel industries, as well as the railroads, while allowing most other businesses to remain privately owned.

In recent decades, European governments have *privatized* many industries that they had previously nationalized. As a result, apart from freight railroads, today most industries that are privately owned in the United States are also privately owned in Europe. So, although most countries in Western Europe have larger government sectors, have higher income tax rates, and provide more social services compared with the United States, they are *not* socialist in the earlier Marxist sense.

Several prominent socialist politicians, including Vermont Senator Bernie Sanders and New York Congresswoman Alexandria Ocasio-Cortez, have increased interest in socialism in the United States. These politicians advocate a larger role for government in the economy, including (1) "Medicare for All," under which the federal government would provide medical insurance to the whole population, eliminating private medical insurance; (2) government-paid tuition at two-year and four-year colleges; (3) the "Green New Deal," which would commit the federal government to a variety of steps to ensure that within 10 years energy generation in the United States would involve zero carbon emissions; and (4) higher tax rates on individuals and corporations. These policies resemble those of the social democratic parties of Western Europe, although the Green New Deal might involve greater government involvement in the energy sector than the European parties typically advocate. It appears unlikely that Congress will enact these policies. And, even if enacted, the policies would fall short of Marxist socialism, under which the government directly owns most businesses.

Your Turn: Test your understanding by doing related problem 3.15 at the end of this chapter.

Continued from chapter opener

Economics in Your Life & Career

The Trade-offs When You Buy a Vehicle

At the beginning of the chapter, we asked you to think about two questions: What is the relationship between safety and fuel efficiency for gasoline-powered vehicles? and If you were a manager at an automobile manufacturer, how might you evaluate the relationship between safety and fuel efficiency when designing vehicles?

To answer the first question, you have to recognize that there is a trade-off between safety and fuel efficiency. With the technology available at any particular time, an automobile manufacturer can increase fuel efficiency by making a vehicle smaller and lighter. But driving a lighter vehicle increases your chances of being injured if you have an accident. The trade-off between safety and fuel efficiency would look much like the relationship in Figure 2.1.

To answer the second question, to increase both safety and fuel efficiency, automobile makers would have to discover new technologies that allow them to make vehicles lighter and safer at the same time. Such new technologies would make points like *G* in Figure 2.1 attainable. As a manager at an automobile manufacturer, you would need to take into account federal regulations that require certain levels of safety and fuel efficiency. Assuming that you had met those regulatory requirements, consumer preferences would determine how you would trade off safety versus fuel efficiency in designing vehicles.

Conclusion

We have seen that by trading in markets, people are able to specialize and pursue their comparative advantage. Trading on the basis of comparative advantage makes the participants better off. The key role of markets is to facilitate trade. In fact, the market system is a very effective means of coordinating the decisions of millions of consumers, workers, and firms. At the center of the market system is the consumer. To be successful, firms must respond to the preferences of consumers. These preferences are communicated to firms through prices. We continue to explore how markets work in Chapter 3, when we develop the model of demand and supply.

Before moving on to Chapter 3, read *An Inside Look* on the next page to learn whether truckers will be fueling their big rigs with hydrogen thanks to a partnership between Japanese company Toyota and North American trucking group PACCAR.

AN **INSIDE** LOOK

Will Truckers Be Fueling Their Big Rigs with Hydrogen?

FINANCIAL TIMES

Inside Toyota's next big bet

ⓐ [In early May 2023,] the Japanese auto group Toyota announced it had struck a deal with the North American trucking group PACCAR to develop two new long-distance haulage vehicles called Kenworth and Peterbilt. Nothing odd about that, you might think: mobility companies often team up in different parts of the supply chain, and haulage is a vast business.

But these vehicles come with a striking twist: the trucks, which will roll off the assembly line later [in 2023] and go into mass production in 2025, are powered by hydrogen fuel cell modules instead of diesel engines. And the two companies hope to "realise a future where hydrogen fuel cell technology can power heavy-duty trucks that can travel across highways throughout the U.S. with zero emissions," as Christopher Yang, a top Toyota executive, explained.

Or as John Rich, PACCAR vice-president, declared: "This is not a pilot. This is not an experiment. It's not a trial. We've done all that. This is a tool that is ready to go to work — purchased, deployed and supported with all the durability and uptime expectations of the diesel engine . . . . Hydrogen presents the best zero-emission technology solution for long-distance Class 8 trucks." . . .

The . . . practical challenge today is whether there will ever be the infrastructure to support the widespread usage of hydrogen vehicles. It took decades to roll out America's networks of "gas" (i.e. petrol) stations along its highways. And while electric vehicle usage has recently soared in the passenger car market, and a network of EV recharging stations has emerged on the east and west coasts of America, there are currently very few hydrogen fuelling stations — precisely because this fuel is relatively new.

ⓑ However, Toyota has been quietly developing hydrogen vehicles since 2021 in the United States, and already launched a passenger vehicle series called the Mirai. . . . To support these, Toyota is working with oil majors such as Shell, Exxon and Chevron to roll out charging stations in California. This is proceeding relatively slowly, due to the horrific complexities of American local planning laws. But since the Mirai has a range of up to 400 miles, and dozens of stations have now been installed, these passenger vehicles are now on the road in California.

ⓒ However, the holy grail for Toyota is the trucking sector. "We think that hydrogen holds out more promise than electric batteries for big vehicles," Gill Pratt, a top Toyota executive, told me. One reason is that with current technologies, electric batteries need to be monstrously big and heavy to power trucks. Worse still, charging an electric battery for a truck can take many hours — and truckers do not want to waste this valuable time when they are on the road. EV batteries also require rare earth minerals and metals, such as lithium — and as Elon Musk, the self-styled king of EVs, has often pointed out, these items are in increasingly short supply.

Hydrogen fuel cell modules, by contrast, can be charged in a matter of minutes using pressurised systems. . . . The modules are far smaller and lighter than electric batteries, and fairly easy to install — which truckers like. . . . They also use smaller amounts of rare earth minerals. . . . [We] will certainly hear a great deal more about hydrogen in the coming months, since the Inflation Reduction Act has created some astonishingly large subsidies for hydrogen production in America, relative to Europe and Asia. So much so that Toyota now expects to use hydrogen fuel cells for a host of other purposes, such as regular household energy usage.

Indeed, the one thing that can be stated with confidence is that we are still in a fairly early stage of this race to create clean energy. "We don't know with certainty what tech solution will be best since there is still so much innovation occurring," Pratt adds. "So we are exploring several alternatives with a diverse portfolio of solutions." In plain English: companies need to stay flexible.

Key Points in the Article

Japanese automaker Toyota is collaborating with North American commercial truck manufacturer PACCAR to develop vehicles for PACCAR's Kenworth and Peterbilt brands. These trucks, scheduled to go into mass production in 2025, will be powered by zero-emission hydrogen fuel cell modules instead of diesel engines. Toyota has been developing hydrogen vehicles in the United States since 2021 and is working with major oil companies to provide charging stations in California, where it has already introduced its hydrogen-powered passenger vehicle, the Mirai. According to a top executive, Toyota believes that hydrogen is more promising than electric batteries for big vehicles and is focusing its efforts on the commercial truck sector. Commercial trucks can use hydrogen fuel cells more efficiently than they can use electric batteries.

Analyzing the News

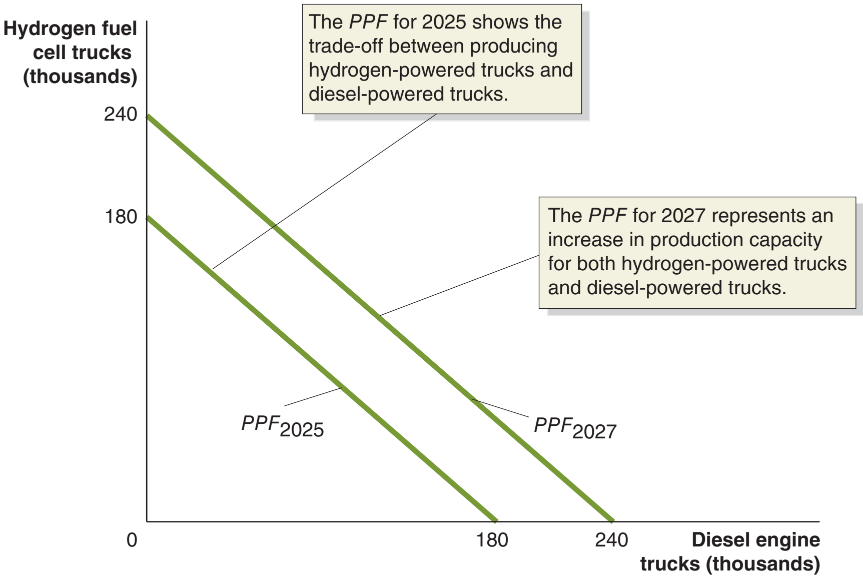
ⓐ In 2023, PACCAR, in collaboration with Toyota, planned to start producing a limited number of hydrogen fuel cell–powered commercial trucks under its Kenworth and Peterbilt brands, with mass production scheduled to begin in 2025. PACCAR faces trade-offs in choosing which goods to produce. Suppose PACCAR must choose between producing hydrogen-powered trucks and diesel-powered trucks, and it has the capacity to produce a total of 180,000 vehicles per year beginning in 2025. This capacity is represented by PPF_{2025} in the figure below. The figure shows that PACCAR would have to sacrifice production (and therefore sales) of one truck type to produce more of the other type. If the market grows for both hydrogen- and diesel-powered trucks, PACCAR will need to build a larger factory to produce a larger number of trucks. In the figure, PPF_{2027} represents the capacity of the larger factory.

ⓑ Toyota has been developing hydrogen-fueled vehicles in the United States, and in early 2023, it began selling the Mirai, a midsized hydrogen-powered passenger car. When deciding to develop car models that use hydrogen fuel cells instead of electric motors or gasoline engines, managers at Toyota had to decide how to allocate resources. Toyota has also been working with big oil companies to set up the needed hydrogen fuel charging stations for its customers. The investment in hydrogen vehicles and charging stations represents a trade-off for Toyota because it takes resources away from other potential projects.

ⓒ Managers at PACCAR and Toyota must consider demand from potential customers when they evaluate the trade-off in allocating resources between hydrogen- and electric-powered vehicles. Due to the global push to reduce carbon emissions and based on current technology, the companies believe that hydrogen fuel cells are a better option than electric motors for powering commercial trucks. Compared to electric batteries, hydrogen fuel cell modules are smaller, lighter, and use fewer rare earth minerals. Fuel cell modules can also be charged much more quickly and are relatively easy to install—two key features for many truck drivers. When making decisions on allocating resources for hydrogen fuel cell production, Toyota's managers must also take into account subsidies offered for hydrogen production included in the U.S. Inflation Reduction Act of 2022.

Thinking Critically

1. Suppose that from 2025 to 2027, the resources PACCAR uses to produce its trucks remain constant, while improvements in technology allow PACCAR to produce a larger quantity of hydrogen fuel cell trucks but no additional diesel engine trucks. Draw a graph that illustrates this change in technology. Be sure to show both the 2025 *PPF* and the new 2027 *PPF*. (Note that your *PPF* for 2027 will be different from the one shown in the graph below.) What is the opportunity cost to PACCAR of producing one hydrogen fuel cell truck in 2025? Is the opportunity cost higher or lower in 2027?
2. Assume that the figure below accurately represents PACCAR's *PPF*s for 2025 and 2027. Now, suppose that in 2027, PACCAR receives orders for 170,000 hydrogen fuel cell trucks and 95,000 diesel engine trucks. Explain whether PACCAR can fill all these orders.



These *PPF*s show the trade-off PACCAR's managers face between producing different truck types and how that trade-off may change over time.

CHAPTER SUMMARY AND PROBLEMS

Key Terms

Absolute advantage, p. 52
Circular-flow diagram, p. 57
Comparative advantage, p. 52
Economic growth, p. 49
Entrepreneur, p. 62
Factor market, p. 56
Factors of production, p. 56
Free market, p. 58
Market, p. 56
Opportunity cost, p. 45
Product market, p. 56
Production possibilities frontier (*PPF*), p. 44
Property rights, p. 63
Scarcity, p. 44
Trade, p. 49

2.1 Production Possibilities Frontiers and Opportunity Costs

LEARNING OBJECTIVE: Use a production possibilities frontier to analyze opportunity costs and trade-offs.

Summary

The **production possibilities frontier (*PPF*)** is a curve that shows the maximum attainable combinations of two goods that can be produced with available resources. The *PPF* is used to illustrate the trade-offs that arise from **scarcity**. Points on the *PPF* are technically efficient, points inside the *PPF* are inefficient, and points outside the *PPF* are unattainable. The **opportunity cost** of any activity is the highest-valued alternative that must be given up to engage in that activity. Because of increasing marginal opportunity costs, *PPF*s are usually bowed out rather than straight lines. This illustrates the important economic concept that the more resources that are already devoted to any activity, the smaller the payoff from devoting additional resources to that activity is likely to be. **Economic growth** is illustrated by an outward shift in the *PPF*.

Review Questions

1.1 What do economists mean by *scarcity*? Can you think of anything that is not scarce according to the economic definition?

1.2 What is a production possibilities frontier? How can we show efficiency on a production possibilities frontier? How can we show inefficiency? What causes a production possibilities frontier to shift outward?

1.3 What does increasing marginal opportunity costs mean? What are the implications of this principle for the shape of the production possibilities frontier?

Problems and Applications

1.4 Draw a production possibilities frontier that shows the trade-off between the production of cotton and the production of soybeans.

a. Show the effect that a prolonged drought would have on the initial production possibilities frontier.

b. Suppose that genetic modification makes soybeans resistant to insects, allowing yields to double. Show the effect of this technological change on the initial production possibilities frontier.

1.5 **[Related to the Chapter Opener]** One of the trade-offs Ford faces is between safety and the maximum range someone can drive an electric vehicle before having to recharge it. For example, adding steel to a vehicle makes it safer but also heavier, which results in fewer miles between recharges. Draw a hypothetical production possibilities frontier that Ford engineers face that shows this trade-off.

1.6 **[Related to the Chapter Opener]** In 2022, Ford executives announced that they intended to expand capacity at their River Rouge complex in order to triple production of the electric F-150 Lightning pickups by July 2023. Ford did not intend to use the expanded capacity to increase production of the gasoline-powered version of the F-150. Draw a production possibilities frontier showing the trade-off Ford faced beginning in July 2023 between producing gasoline F-150s and Lightnings.

1.7 Prices for hotel rooms were, on average, 13 percent higher in 2022 than in 2019. At the same time, delays in making room renovations and labor shortages caused guest satisfaction to plummet. An article in the *Wall Street Journal* explained: "While some big properties used the pandemic to get ahead on renovations, most were trying to survive as bookings plunged. Many put funds typically reserved for improvements toward expenses such as leases." If a hotel paid for a lease using funds that it had initially planned to use for room renovations, what was the opportunity cost of the hotel's decision?

1.8 Consider the following situations involving opportunity cost.

a. In an academic article, Craig Garthwaite, an economist at Northwestern University, wrote that "the cost of consuming a book is the combination of the retail price and the opportunity cost of the time spent reading." Do you agree? Isn't the cost of consuming a book just the price you pay to buy the book? Why include the cost of the time spent reading the book in the cost of consuming the book?

b. Andrea J. Caceres-Santamaria, an economist at the Federal Reserve Bank of St. Louis, discusses two examples of opportunity cost:

i. "A student spends three hours and $20 at the movies the night before an exam."

Is the student's opportunity cost $20? Briefly explain.

ii. "Imagine you're at the mall and deciding between two different smoothie flavors—mango or strawberry-banana. Both cost $7." Caceres-Santamaria explains that if you buy the mango smoothie, the opportunity cost is *not* best measured by the value you place on the strawberry-banana smoothie that you have to give up to buy the mango smoothie. Briefly explain her reasoning.

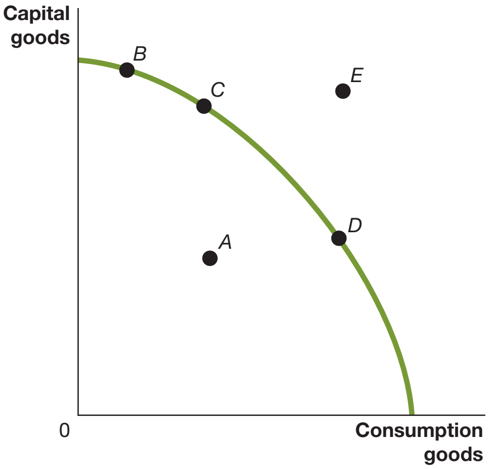
1.9 Suppose we can divide all the goods produced by an economy into two types: consumption goods and capital goods. Capital goods, such as machinery, equipment, and computers, are goods used to produce other goods.

a. Use a production possibilities frontier graph to illustrate the trade-off to an economy between producing consumption goods and producing capital goods. Is it likely that the production possibilities frontier in this situation will be a straight line (as in Figure 2.1) or bowed out (as in Figure 2.2)? Briefly explain.

b. Suppose a technological change occurs that allows firms to produce more capital goods with a given amount of labor but that has no effect on firms' ability to produce consumption goods. Show the effect on the production possibilities frontier.

c. Suppose that Liechtenstein and Luxembourg currently have identical production possibilities frontiers but that Liechtenstein devotes only 5 percent of its resources to producing capital goods over each of the next 10 years, while Luxembourg devotes 30 percent. Use a production possibilities frontier to explain which country is likely to experience more rapid economic growth in the future. Your graph should include production possibilities frontiers for Liechtenstein and Luxembourg both for today and in 10 years.

1.10 Use the following production possibilities frontier for a country to answer the questions.



a. Which point or points are unattainable? Briefly explain why.

b. Which point or points are efficient? Briefly explain why.

c. Which point or points are inefficient? Briefly explain why.

d. At which point is the country's future growth rate likely to be the highest? Briefly explain why.

1.11 **[Related to Solved Problem 2.1]** You have exams in economics and chemistry coming up, and you have 5 hours available for studying. The following table shows the trade-offs you face in allocating the time you will spend studying each subject.

	Hours Spent Studying		Midterm Score	
Choice	**Economics**	**Chemistry**	**Economics**	**Chemistry**
A	5	0	95	70
B	4	1	93	78
C	3	2	90	84
D	2	3	86	88
E	1	4	81	90
F	0	5	75	91

a. Use the data in the table to draw a production possibilities frontier graph. Label the vertical axis "Score on economics exam" and label the horizontal axis "Score on chemistry exam." Make sure to label the values where your production possibilities frontier intersects the vertical and horizontal axes. (Note that the origin in your graph will not occur at 0,0.)

b. Label the points representing choice *C* and choice *D*. If you are at choice *C*, what is your opportunity cost of increasing your chemistry score by 4 points?

c. Under what circumstances would choice *A* be sensible?

1.12 **[Related to the Economics in Your Life & Career]** An editorial in the *New York Times* discussed whether the federal government should enact regulations that would force firms to accept lower prices when selling pharmaceuticals and medical devices. The editorial noted that European countries that have such regulations "accept a trade-off, inherent in this approach, that the United States has so far resisted: They forgo access to certain innovations, like pricey new drugs and medical devices . . . ."

a. Why might price regulations reduce the number of new drugs and medical devices that firms offer for sale?

b. Suppose that you are the economic adviser to a presidential candidate who is trying to decide whether she should support a proposal that Congress impose such regulations on the prices of pharmaceuticals and medical devices. You need to prepare a report discussing the relevant factors the candidate should consider. Use the concepts of opportunity cost and trade-offs to discuss some of the main issues you would include in your report.

1.13 A news article described a new prescription drug that costs up to "$94,000 for one 12-week treatment regimen" to treat hepatitis C, which is a liver disease that afflicts as many as 3 million people in the United States. It can result in severe liver damage and even death. Hepatitis C is potentially curable, but the prescription drugs available to treat it are very expensive. State government Medicaid programs provide medical insurance to people who have low incomes or who are disabled. In Louisiana, spending on Medicaid accounts for nearly half of the state government's budget. Rebekah Gee, the former secretary of the Louisiana Department of Health, was quoted as saying that it is unacceptable that many Medicaid patients with hepatitis C are not receiving treatment, "but it's also unacceptable for me to pay over $700 million and have to cut primary education, gut our payments to universities and decimate the health care delivery system for just one disease condition." What trade-offs do state governments face when new prescription drugs are introduced that have much higher prices than existing drugs? What factors should state governments take into account when deciding how to allocate the scarce funds in their budgets?

1.14 Harvard economist Lawrence Summers served as secretary of the Treasury in the Clinton administration and as director of the National Economic Council in the Obama administration. He has been quoted as giving the following defense of the economic approach to policy issues:

> There is nothing morally unattractive about saying: We need to analyze which way of spending money on health care will produce more benefit and which less, and using our money as efficiently as we can. I don't think there is anything immoral about seeking to achieve environmental benefits at the lowest possible costs.

Would it be more ethical to reduce pollution without worrying about the cost or by taking the cost into account? Briefly explain.

1.15 In *The Wonderful Wizard of Oz* and his other books about the Land of Oz, L. Frank Baum observed that if people's wants were limited enough, most goods would not be scarce. According to Baum, this was the case in Oz:

> There were no poor people in the Land of Oz, because there was no such thing as money. . . . Each person was given freely by his neighbors whatever he required for his use, which is as much as anyone may reasonably desire. Some tilled the lands and raised great crops of grain, which was divided equally among the whole population, so that all had enough. There were many tailors and dressmakers and shoemakers and the like, who made things that any who desired them might wear. Likewise there were jewelers who made ornaments for the person, which pleased and beautified the people, and these ornaments also were free to those who asked for them. Each man and woman, no matter what he or she produced for the good of the community, was supplied by the neighbors with food and clothing and a house and furniture and ornaments and games. If by chance the supply ever ran short, more was taken from the great storehouses of the Ruler, which were afterward filled up again when there was more of any article than people needed . . . .
>
> You will know, by what I have told you here, that the Land of Oz was a remarkable country. I do not suppose such an arrangement would be practical with us.

Briefly explain whether you agree with Baum that the economic system in Oz wouldn't work in the contemporary United States.

2.2 Comparative Advantage and Trade

LEARNING OBJECTIVE: Describe comparative advantage and explain how it serves as the basis for trade.

Summary

Fundamentally, markets are about **trade**, which is the act of buying and selling. People trade on the basis of comparative advantage. An individual, a firm, or a country has a **comparative advantage** in producing a good or service if it can produce the good or service at the lowest opportunity cost. People are usually better off specializing in the activity for which they have a comparative advantage and trading for the other goods and services they need. It is important not to confuse comparative advantage with absolute advantage. An individual, a firm, or a country has an **absolute advantage** in producing a good or service if it can produce more of that good or service using the same amount of resources. It is possible to have an absolute advantage in producing a good or service without having a comparative advantage.

Review Questions

2.1 What is absolute advantage? What is comparative advantage? Is it possible for a country to have a comparative advantage in producing a good without also having an absolute advantage? Briefly explain.

2.2 What is the basis for trade: absolute advantage or comparative advantage? How can an individual or a country gain from specialization and trade?

Problems and Applications

2.3 Although relations between the United States and China have declined over national security concerns, the *Wall Street Journal* reported that the United States imported $536.8 billion of goods from China in 2022, an increase of 6.3 percent from 2021. "China is a dominant supplier of many products that are in demand in the U.S., including cellphones, personal computers and solar panels," Ed Gresser, a former assistant U.S. trade representative explained. "A very large and integrated trade and investment relationship . . . has a tendency to weather political ups and downs. . . . China . . . can provide very large quantities of products in a short amount of time." Assume that China has a comparative advantage relative to the United States in the production of water bottles.

a. Compared to the United States, must China have an absolute advantage in the production of water bottles?

b. Compared to China, could the United States have an absolute advantage in the production of water bottles?

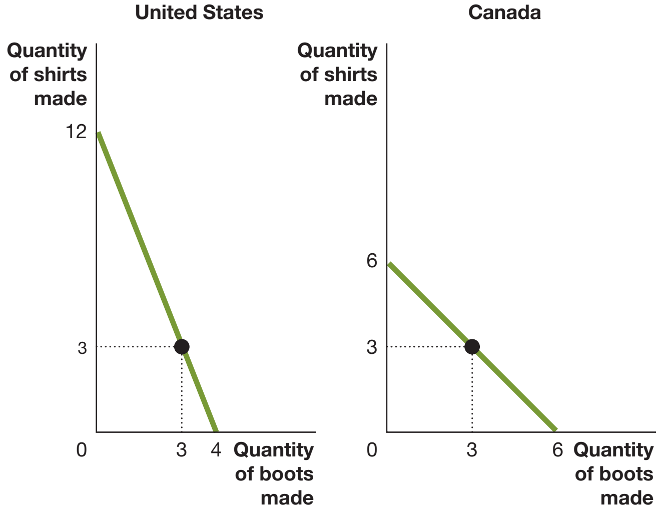
2.4 Review the information in Figure 2.4. Choose a rate of trading cherries for apples different from the rate used in the text (15 pounds of cherries for 10 pounds of apples) that will allow you and your neighbor to benefit from trading. Prepare a table like Table 2.1 to illustrate your answer.

2.5 In an opinion column in the *Wall Street Journal*, economist Richard McKenzie of the University of California, Irvine wrote:

> If countries import goods that can be made more cheaply abroad than at home, and produce goods that can be made more cheaply at home than abroad, then all trading nations will end up with more income and wealth than if they tried to produce everything themselves.

Briefly explain his reasoning.

2.6 Using the same amount of resources, the United States and Canada can both produce lumberjack shirts and lumberjack boots, as shown in the following production possibilities frontiers.



- **a.** Which country has a comparative advantage in producing lumberjack boots? Which country has a comparative advantage in producing lumberjack shirts? Briefly explain.
- **b.** Does either country have an absolute advantage in producing both goods? Briefly explain.
- **c.** Suppose that both countries are currently producing three pairs of boots and three shirts. Show that both can be better off if they each specialize in producing one good and then trade for the other.

2.7 **[Related to the Don't Let This Happen to You]** A columnist for *Forbes* argues, "Even if China is always better than Spain at producing textiles, if the best thing that Spain could be doing is textiles, then that's what Spain should be doing."

- **a.** What does the columnist mean by "China is always better than Spain" in producing textiles (which include clothing, sheets, and similar products)? Is the columnist arguing that China has an absolute advantage over Spain in producing textiles, a comparative advantage, or both? Briefly explain.
- **b.** The columnist notes that, in fact, Spain exports significant quantities of textiles. If his description of the situation in China and Spain is accurate, briefly explain how Spanish firms are able to export textiles in competition with Chinese firms.

2.8 **[Related to Solved Problem 2.2]** Suppose the United Kingdom and Norway both produce oil and fish oil, which are sold for the same prices in both countries. The following table shows the combinations of both goods that each country can produce in a day, measured in thousands of barrels, using the same amounts of capital and labor.

United Kingdom		Norway	
Oil	**Fish Oil**	**Oil**	**Fish Oil**
0	8	0	4
2	6	1	3
4	4	2	2
6	2	3	1
8	0	4	0

- **a.** Which country has a comparative advantage in producing oil? Briefly explain.
- **b.** Can these two countries gain from trading oil and fish oil with each other? Briefly explain.

2.9 **[Related to Solved Problem 2.2]** Suppose that France and Germany both produce cheese and wine. The following table shows combinations of the goods that each country can produce in a day.

France		Germany	
Wine (bottles)	**Cheese (pounds)**	**Wine (bottles)**	**Cheese (pounds)**
0	8	0	15
1	6	1	12
2	4	2	9
3	2	3	6
4	0	4	3
		5	0

- **a.** Which country has a comparative advantage in producing wine? Which country has a comparative advantage in producing cheese?
- **b.** Suppose that France is currently producing 1 bottle of wine and 6 pounds of cheese, and Germany is currently producing 3 bottles of wine and 6 pounds of cheese. Demonstrate that France and Germany can both be better off if they specialize in producing only one good and then trade for the other.

2.10 Can an individual or a country produce beyond its production possibilities frontier? Can an individual or a country consume beyond its production possibilities frontier? Briefly explain.

2.11 If Nicaragua can produce, with the same amount of resources, twice as much coffee as Colombia, explain how Colombia could have a comparative advantage in producing coffee.

2.12 Raghuram Rajan is a former governor of the Reserve Bank of India. An opinion column on bloomberg.com quotes Rajan as stating the following about international trade: "It involves countries with very different income levels, allowing each to bring its comparative advantage to the production process." Average incomes in the United States are more than nine times greater than in India. If incomes in the United States are so much higher than in India, how can the United States be made better off by trading with India? If incomes in India are so much lower than in the United States, how can India be made better off trading with the United States?

2.13 Imagine that the next time the Buffalo Bills play the New England Patriots at Highmark Stadium in Orchard Park, New York, Bills star quarterback Josh Allen has a temporary lack of judgment and plans to sell Bills memorabilia during the game because he realizes that he can sell five times more Bills products than anyone in the stadium sports gear store. Likewise, imagine that you are a creative and effective manager at work, and that you tell your employees that during the next six months, you plan to clean all of their offices because you can clean five times better than the cleaning staff. What error in judgment are both Josh and you making? Why shouldn't each of you do what you are better at doing than anyone else?

2.14 In colonial America, the population was spread thinly over a large area, and transportation costs were very high because it was difficult to ship products by road for more than short distances. As a result, most of the free population lived on small farms, where people not only grew their own food but also usually made their own clothes and very rarely bought or sold anything for money. Explain why the incomes of these farmers were likely to rise as transportation costs fell. Use the concept of comparative advantage in your answer.

2.15 During the 1928 U.S. presidential election campaign, Herbert Hoover, the Republican candidate, argued that the United States should import only products that could not be produced here. Briefly explain whether this policy would be likely to raise average income in the United States.

2.16 **[Related to the Apply the Concept "Comparative Advantage, Opportunity Cost, and Housework"]** In discussing dividing up household chores, Emily Oster, an economist at Brown University, advised, "No, you shouldn't always unload the dishwasher because you're better at it." If you are better at unloading the dishwasher, why shouldn't you be the one to unload it?

2.3 The Market System

LEARNING OBJECTIVE: Explain the basics of how a market system works.

Summary

A **market** is a group of buyers and sellers of a good or service and the institution or arrangement by which they come together to trade. **Product markets** are markets for goods and services, such as computers and medical treatment. **Factor markets** are markets for the **factors of production**, such as labor, capital, natural resources, and entrepreneurial ability. The **circular-flow diagram** shows how participants in product markets and factor markets are linked. Adam Smith argued in his 1776 book *The Wealth of Nations* that in a **free market**, in which the government does not control the production of goods and services, changes in prices lead firms to produce the goods and services most desired by consumers. If consumers demand more of a good, its price will rise. Firms respond to rising prices by increasing production. If consumers demand less of a good, its price will fall. Firms respond to falling prices by producing less of a good. A market system is better than a centrally planned economy at mobilizing information. An **entrepreneur** is someone who operates a business. In the market system, entrepreneurs are responsible for organizing the production of goods and services. The market system will work well only if there is protection for **property rights**, which are the rights of individuals and businesses to use their property.

Review Questions

3.1 What is the circular-flow diagram, and what does it demonstrate?

3.2 What are the two main categories of participants in markets? Which participants are of greatest importance in determining what goods and services are produced?

3.3 What is a free market? In what ways does a free market economy differ from a centrally planned economy? How does a market system mobilize the information necessary for an economy to operate efficiently?

3.4 What is an entrepreneur? Why do entrepreneurs play a key role in a market system?

3.5 Under what circumstances are firms likely to produce more of a good or service? Under what circumstances are firms likely to produce less of a good or service?

3.6 What are property rights? What role do they play in the working of a market system? Why are independent courts important for a well-functioning economy?

Problems and Applications

3.7 Identify whether each of the following transactions will take place in the factor market or in the product market and whether households or firms are supplying the good or service or demanding the good or service.

- **a.** Tariq buys a Ford-150 Lightning.
- **b.** Ford increases employment at its River Rouge production complex.
- **c.** Tariq works 20 hours per week at McDonald's.
- **d.** Tariq sells the land he owns to McDonald's so that the company can build a new restaurant.

3.8 In an academic article published in 1945, Nobel Laureate Friedrich Hayek wrote:

> Fundamentally, in a system where the knowledge of the relevant facts is dispersed among many people, prices can act to coordinate the separate actions of different people. . . . We must look at the price system as . . . a mechanism for communicating information if we want to understand its real function.

- **a.** Give three examples of "relevant facts" that people need in making economic decisions.
- **b.** Why are the relevant facts likely to be "dispersed among many people"? What problems does the dispersion of these facts pose for a centrally planned economy?
- **c.** How does the price system "act to coordinate the separate actions of different people"?

3.9 **[Related to the Apply the Concept "A Story of the Market System in Action: How Do You Make an iPad?"]** The late Nobel Prize–winning economist Kenneth Arrow of Stanford University once wrote that the argument that the outcomes in a market system "may be very different from, and even opposed to, intentions is surely the most important intellectual contribution that economic thought has made." Briefly explain how it is possible for the outcomes in a market system to be different from what firms and consumers intended them to be. Why is this idea such an important intellectual contribution?

3.10 **[Related to the Apply the Concept "A Story of the Market System in Action: How Do You Make an iPad?"]** In a famous essay on the market system, the economist Leonard Read discussed how a pencil sold by the U.S. firm Eberhard

Faber Pencil Company (now owned by Paper Mate) was made. He noted that logging companies in California and Oregon grew the cedar wood used in the pencil. The wood was milled into pencil-width slats at a factory in San Leandro, California. The graphite for the pencil was mined in Sri Lanka and mixed with clay purchased from a firm in Mississippi and wax from a firm in Mexico. The rubber was purchased from a firm in Indonesia. Was it necessary for the managers of all these firms to know how the components they produced were assembled into a pencil? Was it necessary for the chief executive officer of the Eberhard Faber Pencil Company to know this information? Briefly explain.

3.11 Evaluate the following argument: "Adam Smith's analysis of the market system is based on a fundamental flaw: He assumes that people are motivated by self-interest. But this isn't true. I'm not selfish, and most people I know aren't selfish."

3.12 Writing in the *New York Times*, Michael Lewis argued that "a market economy is premised on a system of incentives designed to encourage an ignoble human trait: self-interest." Do you agree that self-interest is an "ignoble human trait"? What incentives does a market system provide to encourage self-interest?

3.13 Some economists have been puzzled that although entrepreneurs take on the risk of losing money by starting new businesses, on average their incomes are lower than those of people with similar characteristics who go to work at large firms. The late William Baumol believed part of the explanation for this puzzle may be that entrepreneurs are like people who buy lottery tickets. On average, people who don't buy lottery tickets are left with more money than people who buy tickets because lotteries take in more money than they give out. Baumol argued that "the masses of purchasers who grab up the [lottery] tickets are not irrational if they receive an adequate payment in another currency: psychic rewards."

- **a.** What are "psychic rewards"?
- **b.** What psychic rewards might an entrepreneur receive?
- **c.** Do you agree with Baumol that an entrepreneur is like someone buying a lottery ticket? Briefly explain.

3.14 According to an article in the *Economist* magazine,

> In all rich countries, property rights are secure. . . . Legally recognising land ownership has boosted farmers' income and productivity in Latin America and Asia. . . . More than two-thirds of Africa's land is still under customary tenure, with rights to land rooted in communities and typically neither written down nor legally recognized.

- **a.** What does it mean for a country to have secure property rights?
- **b.** Why might we expect that all rich countries would have secure property rights?
- **c.** What problems might African farmers have because they lack secure property rights?

3.15 **[Related to the Apply the Concept "What Is Socialism?"]** A Gallup public opinion poll indicates that among people aged 18 to 29, more have a favorable view of socialism than of capitalism. A columnist in the *Wall Street Journal* comments, "Would these people actually know socialism if they saw it? Taxing the rich, Medicare-for-All, and a Green New Deal that replaces fossil fuels with renewables are certainly liberal, probably radical, possibly unwise. But socialist? Hardly."

- **a.** What definition of socialism is the columnist using if he doesn't consider the programs he lists to be socialist?
- **b.** Is the columnist's definition of socialism one that U.S. socialists like Senator Bernie Sanders and Congresswoman Alexandria Ocasio-Cortez would be likely to accept? Briefly explain.

Critical Thinking Exercise

CT2.1 For this exercise, your instructor may assign you to a group. Can you think of a good or service that is produced entirely by one company—without the purchase of *any* raw materials or other goods or services from another company? First, each member of the group should propose at least one company that might meet this criterion by writing the company's name down on a piece of paper and not showing it to other group members. Second, after each group member has written down a response, the members should then reveal their responses, and the group should discuss whether each company does indeed produce a good or service without any raw materials or goods and services from another company. If you cannot think of many such companies, which concepts from this chapter do you think this difficulty illustrates?

3

Where Prices Come From: The Interaction of Demand and Supply

A Water Bottle as a Status Symbol?

People like to drink water. That statement is hardly shocking, but it was only in 2016 that Americans began drinking more bottled water than soda. In the 1970s, the French firm Perrier was the first to sell significant quantities of bottled spring water in the United States. Since then, bottled water sales have continually increased. In 2021, Americans drank 15.3 billion gallons of bottled water, or about 46 gallons per person, an increase of more than 80 percent since 2009.

Some consumers like bottled water because they are concerned by reports from the U.S. Environmental Protection Agency that unfiltered or improperly filtered tap water may contain chemicals that could lead to health problem such as bladder cancer. On the other hand, some consumers don't purchase bottled water either because they don't want to pay for water they can get from a tap or a drinking fountain for free or because they are concerned about the environmental effect of using bottled water. Millions of barrels of oil are required each year to produce the plastic used for bottled water. Estimates indicate that more than 80 percent of plastic water bottles end up in landfills rather than being recycled. Some plastic from bottles ends up polluting oceans.

If you're concerned about your budget and the environment, purchasing one reusable water bottle is an alternative to using bottled water each day. In recent years, reusable water bottles have become increasingly fashionable. For instance, in October 2022, Oprah Winfrey posted a video to her website praising the Beysis water bottle: "Here's what I love so much: I was looking for the perfect water bottle. I love the smoothness of this one when you pull it out of your bag." The *Wall Street Journal* published an article on the Stanley Quencher water bottle, which it called "the new office status symbol." According to the article, sales increased 275 percent during 2022 after the bottle became a favorite with "millennial women with large social-media followings." An article on yahoo.com referred to the Yeti Rambler water bottle as a "cult favorite."

In recent years, new entrants to the water bottle industry have competed by offering bottles made of different materials or with different styles and features. For instance, HidrateSpark and REBO sell so-called smart water bottles that interact with smartphone apps to keep track of how much water you're drinking and remind you when your intake is below what you had planned.

Cast Of Thousands/Shutterstock

Water bottles are manufactured primarily in factories in Asia that employ low-wage labor. Firms face relatively low costs when contracting with these factories to begin manufacturing water bottles, which eases the entry of new firms into the industry. As a result, competition in this market is intense, and firms have to respond quickly to changes in consumer tastes.

Although sales of water bottles were strong in 2023, there are no guarantees in a market system. Celebrity endorsements have helped make water bottles fashionable, but consumer tastes can change. In the long run, in any industry, competition and changes in consumer tastes can force down prices and eliminate the profits firms are currently earning. Changes in consumer tastes have greatly reduced the demand for many products, such as hats and conventional wristwatches, that at one time most people bought.

Although competition is not always good news for firms, it is great news for consumers because it increases the choice of available products and lowers the prices consumers pay for those products.

AN INSIDE LOOK at the end of this chapter discusses an Australian startup that produces edible beverage cups to address environmental concerns.

Chapter Outline & Learning Objectives

3.1 The Demand Side of the Market, page 76
List and describe the variables that influence demand.

3.2 The Supply Side of the Market, page 84
List and describe the variables that influence supply.

3.3 Market Equilibrium: Putting Demand and Supply Together, page 89
Use a graph to illustrate market equilibrium.

3.4 The Effect of Demand and Supply Shifts on Equilibrium, page 92
Use demand and supply graphs to predict changes in prices and quantities.

Economics in Your Life & Career

Can You Forecast the Future Demand for Water Bottles?

Firms face many challenges in responding to changes in consumer demand. For example, firms selling water bottles need to forecast future demand in order to determine how much production capacity they will need. If you were a manager for a firm that sells water bottles, such as Yeti, Hydro Flask, or Thermos, what factors would you take into account in forecasting future demand? As you read this chapter, try to answer this question. You can check your answer against the one we provide at the end of this chapter.

In Chapter 1 we explored how economists use models to predict human behavior. In Chapter 2 we used the production possibilities frontier (*PPF*) model to analyze scarcity and trade-offs. In this chapter we explore the model of demand and supply, which is the most powerful tool in economics, and use the model to explain how prices are determined.

Economic models are simplified versions of reality that are based on assumptions. In some cases, the assumptions of a model may not describe exactly the economic situation we are analyzing. For example, the model of demand and supply assumes that we are analyzing a **perfectly competitive market**, which is a market where there are many buyers and sellers, all the products sold are identical, and there are no barriers to new firms entering the market. These assumptions are very restrictive and apply exactly to only a few markets, such as the markets for wheat and other agricultural products. However, the model of demand and supply has proven to be very useful in analyzing markets where competition among sellers is intense, even if there are relatively few sellers and the products being sold are not identical. In recent studies, the model of demand and supply has been successful in analyzing markets with as few as four buyers and four sellers. As we will see in this chapter, in many markets we can use this model to accurately predict changes in quantities and prices.

Perfectly competitive market A market that meets the conditions of having (1) many buyers and sellers, (2) all firms selling identical products, and (3) no barriers to new firms entering the market.

We begin studying the model of demand and supply by discussing consumers and the demand side of the market, and then we turn to firms and the supply side. Throughout this text, we will apply this model to understand business, the economy, and economic policy.

3.1 The Demand Side of the Market

LEARNING OBJECTIVE: List and describe the variables that influence demand.

We saw in Chapter 2 that in a market system, consumers ultimately determine which goods and services will be produced. The most successful businesses are the ones that respond best to consumer demand. But what determines consumer demand for a product? Certainly, many factors influence the willingness of consumers to buy a particular product. For example, consumers who are considering buying a water bottle, such as a Hydro Flask or a Stanley Quencher, will make their decisions based on, among other factors, the income they have available to spend and the effectiveness of the advertising campaigns of the companies that sell water bottles. For most consumers, the primary factor in their buying decision is the price of the product. So, we focus on this factor first. As we discuss demand, keep in mind that we are considering not what a consumer *wants* to buy but what the consumer is both willing and *able* to buy.

Demand Schedules and Demand Curves

Tables that show the relationship between the price of a product and the quantity of the product demanded are called **demand schedules**. The table in Figure 3.1 shows the quantity of water bottles consumers would be willing and able to buy per week at five different prices. The amount of a good or service that a consumer is willing and able to purchase at a given price is called the **quantity demanded**. The graph in Figure 3.1 plots the numbers from the table as a **demand curve**, which shows the relationship between the price of a product and the quantity of the product demanded. (Note that, for convenience, we made the demand curve in Figure 3.1 a straight line, or linear. However, there is no reason that all demand curves need to be straight lines.) The demand curve in Figure 3.1 shows the **market demand**, which is the demand by all the consumers of a given good or service. The type of product determines which consumers are included in its market:

- The market for a product that is sold locally, such as restaurant meals, would include all the consumers in a city or other relatively small area.
- The market for a product that is sold internationally, such as reusable water bottles, would include all the consumers in the world.

Demand schedule A table that shows the relationship between the price of a product and the quantity of the product demanded.

Quantity demanded The amount of a good or service that a consumer is willing and able to purchase at a given price.

Demand curve A curve that shows the relationship between the price of a product and the quantity of the product demanded.

Market demand The demand by all the consumers of a given good or service.

Demand Schedule	
Price (dollars per bottle)	Quantity (millions of bottles per week)
$30	3
25	4
20	5
15	6
10	7

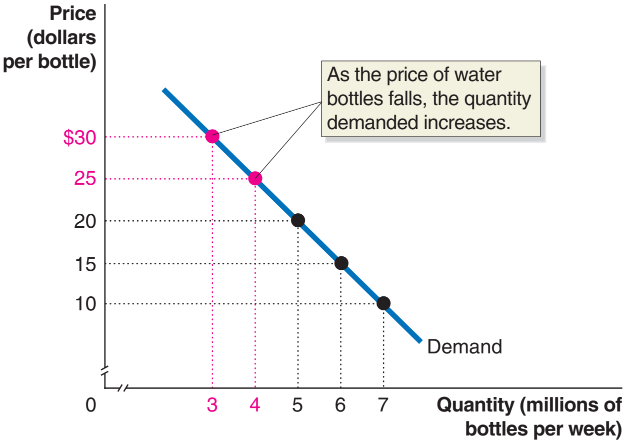


Figure 3.1

A Demand Schedule and Demand Curve

As the price of water bottles changes, consumers change the quantity they are willing and able to buy. We can show this as a *demand schedule* in a table or as a *demand curve* on a graph. The table and graph both show that as the price of water bottles falls, the quantity demanded increases. When the price of a water bottle is $30, consumers buy 3 million bottles per week. When the price falls to $25, consumers buy 4 million per week. Therefore, the demand curve for water bottles is downward sloping.

The demand curve in Figure 3.1 slopes downward because consumers will buy more water bottles as the price falls. When the price of a water bottle is $30, consumers buy 3 million per week. When the price falls to $25, consumers buy 4 million per week. Buyers demand a larger quantity of a product as the price falls because the product becomes less expensive relative to other products and because they can afford to buy more at a lower price.

The Law of Demand

The inverse relationship between the price of a product and the quantity of the product demanded is called the **law of demand**: Holding everything else constant, when the price of a product falls, the quantity demanded of the product will increase, and when the price of a product rises, the quantity demanded of the product will decrease. The law of demand holds for any market demand curve. Economists have found only a very few exceptions to this law.

Law of demand A rule that states that, holding everything else constant, when the price of a product falls, the quantity demanded of the product will increase, and when the price of a product rises, the quantity demanded of the product will decrease.

What Explains the Law of Demand?

It makes sense that consumers will buy more of a good when its price falls and less of a good when its price rises, but let's look more closely at why this result holds. When the price of a product falls, consumers buy a larger quantity because of two effects:

1. The **substitution effect** refers to the change in the quantity demanded of a good that results because a change in price makes the good more or less expensive *relative* to other goods that are *substitutes*.

   Example: When the price of water bottles falls, people will substitute buying water bottles for buying other goods, such as bottled spring water.

2. The **income effect** of a price change refers to the change in the quantity demanded of a good that results because a change in the good's price increases or decreases consumers' purchasing power. *Purchasing power* is the quantity of goods a consumer can buy with a fixed amount of income.

   Example: When the price of water bottles falls, the increased purchasing power of consumers' incomes will usually lead them to purchase a larger quantity of water bottles. When the price rises, the decreased purchasing power of consumers' incomes will usually lead them to purchase a smaller quantity.

Substitution effect The change in the quantity demanded of a good that results from a change in price making the good more or less expensive relative to other goods, holding constant the effect of the price change on consumer purchasing power.

Income effect The change in the quantity demanded of a good that results from the effect of a change in price on consumer purchasing power, holding all other factors constant.

Although we can analyze them separately, the substitution effect and the income effect occur simultaneously whenever a price changes. So, a fall in the price of water bottles leads consumers to buy more bottles both because:

1. Water bottles are now less expensive relative to substitute products, and
2. The purchasing power of consumers' incomes has increased.

Holding Everything Else Constant: The *Ceteris Paribus* Condition

Notice that the definition of the law of demand contains the phrase *holding everything else constant*. In constructing the market demand curve for water bottles, we focused only on the effect that changes in the price of water bottles would have on the quantity consumers would be willing and able to buy. We were holding constant other variables that might affect the willingness of consumers to buy water bottles. Economists use the term ***ceteris paribus* condition** to refer to the necessity of holding all variables other than price constant in constructing a demand curve. *Ceteris paribus* means "all else equal" in Latin.

***Ceteris paribus* ("all else equal") condition** The requirement that when analyzing the relationship between two variables—such as price and quantity demanded—other variables must be held constant.

What would happen if we allowed a change in a variable—other than price—that might affect the willingness of consumers to buy water bottles? Consumers would then change the quantity they demanded at each price. We can illustrate this effect by shifting the market demand curve. A shift of a demand curve is either *an increase or a decrease in demand*. A movement along a demand curve is either *an increase or a decrease in the quantity demanded*. As Figure 3.2 shows, the demand curve shifts to the right if consumers decide to buy more water bottles at each price, and the demand curve shifts to the left if consumers decide to buy fewer water bottles at each price.

Variables That Shift Market Demand

Many variables other than price can affect market demand. These six are the most important:

- Income
- Prices of related goods
- Tastes
- Population and demographics
- Expected future prices
- Natural disasters and pandemics

We next discuss how changes in each of these variables affect the market demand curve.

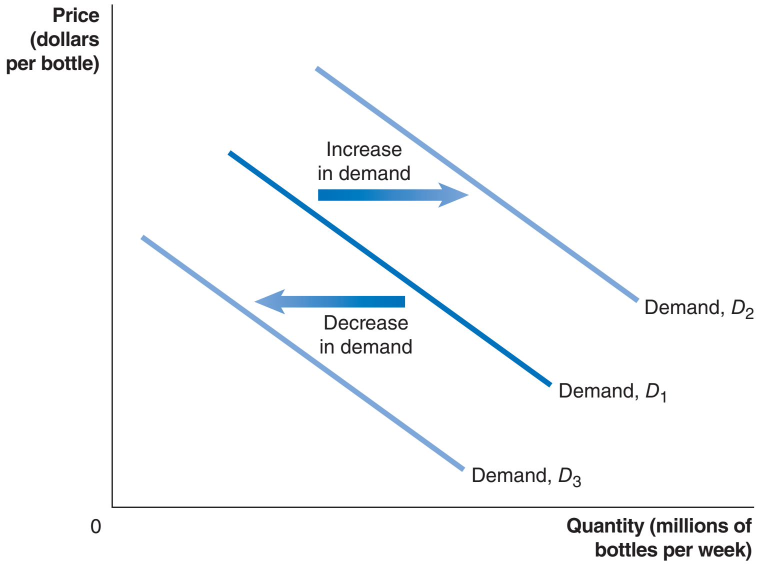
Income The income that consumers have available to spend affects their willingness and ability to buy a good. Suppose that the market demand curve in Figure 3.1 represents the willingness of consumers to buy reusable water bottles when average household income is $62,000. If average household income rises to $83,000, then, as shown in Figure 3.2, the demand curve for water bottles will shift. Whether the good is a *normal* good or an *inferior* good determines in which direction the demand curve shifts. A good is a **normal good** when the demand for the good increases following a rise in income

Normal good A good for which the demand increases as income rises and decreases as income falls.

Figure 3.2

Shifting the Demand Curve

When consumers increase the quantity of a product they want to buy at a given price, the demand curve shifts to the right, from D_1 to D_2. When consumers decrease the quantity of a product they want to buy at a given price, the demand curve shifts to the left, from D_1 to D_3.



and decreases following a fall in income. Most goods are normal goods, but some goods are *inferior goods*. A good is an **inferior good** when the demand for it decreases following a rise in income and increases following a fall in income. For instance, as your income rises, you might buy fewer cans of tuna or packages of instant noodles and buy more salmon or whole grain pasta. So, for you, canned tuna and instant noodles would be examples of inferior goods—not because they are of low quality but because you buy less of them as your income increases.

Inferior good A good for which the demand increases as income falls and decreases as income rises.

Prices of Related Goods The prices of other goods can also affect consumers' demand for a product. Consumers who buy reusable water bottles often do so because they are concerned about staying hydrated during the day. These consumers could instead buy bottled spring water or bottles of soda or sports drinks. Goods and services that can be used for the same purpose are called **substitutes**. When two goods are substitutes, the more you buy of one, the less you will buy of the other. A decrease in the price of a substitute causes the demand curve for a good to shift to the left. An increase in the price of a substitute causes the demand curve for a good to shift to the right.

Substitutes Goods and services that can be used for the same purpose.

Suppose that the market demand curve in Figure 3.1 represents the willingness and ability of consumers to buy reusable water bottles during a week when the average price of a bottle of spring water is $2.00. If the average price of spring water falls to $1.50, then, in Figure 3.2, consumers will demand fewer water bottles at every price, which shifts the demand curve for water bottles to the left.

Goods and services that are used together—such as hot dogs and hot dog buns—are called **complements**. When two goods are complements, the more consumers buy of one, the more they will buy of the other. A decrease in the price of a complement causes the demand curve for a good to shift to the right. An increase in the price of a complement causes the demand curve for a good to shift to the left.

Complements Goods and services that are used together.

When working out at the gym, many people have a water bottle with them. So, for many people, a water bottle and a gym membership are complements. Suppose that the market demand curve in Figure 3.1 represents the willingness of consumers to buy water bottles during a week when the average price of a gym membership is $40 per month. If the price of gym memberships drops to $30 per month, then, in Figure 3.2, consumers will buy more gym memberships *and* more water bottles, so the demand curve for water bottles will shift to the right.

Tastes An advertising campaign for a product can influence consumer demand. For example, many firms promote their water bottles on Instagram, including by paying Instagram celebrities, called *influencers*, to incorporate their bottles in the influencers' posts. If the advertising is effective, consumers are likely to buy more water bottles at every price, and the demand curve will shift to the right. An economist would say that the advertising campaign has affected consumers' *taste* for water bottles. Taste is a catch-all category that refers to the many subjective elements that can enter into a consumer's decision to buy a product. Sometimes trends play a substantial role. For example, the popularity of low-carbohydrate diets caused a decline in demand for some goods, such as bread and donuts, and an increase in demand for fish. In general, when consumers' taste for a product increases, the demand curve will shift to the right, and when consumers' taste for the product decreases, the demand curve will shift to the left.

Apply the Concept

When Did Most People Stop Wearing Hats?

The top photo on the next page shows people in the early 1930s lining up to withdraw their money from a bank. Note that nearly everyone is wearing a hat. The bottom photo shows a group of people today. Note that no one is wearing a hat. This change in consumer tastes was not good news for hat manufacturers. In the early twentieth century, the U.S. hat industry had hundreds of firms and more than 40,000 workers. Today only a few firms in the United States make hats.

Everett Historical/Shutterstock

VGstockstudio/Shutterstock

Most people in the 1930s wore hats, but few people today wear them.

If our great-great-grandparents considered hats an essential article of clothing, why do most people today rarely, if ever, wear hats? Like many other changes in tastes, the decline in hat wearing had no single cause. One reason often suggested for the decline is the increase throughout the twentieth century in the number of people owning cars. Particularly for tall people, a car doesn't have enough headroom to wear a hat. In addition, by the 1930s, most cars were fully enclosed and had reliable heaters, which reduced the need to wear a hat to keep your head warm while driving in cold weather. Following the end of World War II in 1945, some people who served in the military may have started going hatless in reaction to having been required to wear helmets for several years.

Another suggested explanation is the wider availability of warm clothing, which made it less necessary to wear hats in cold weather. Also relevant is the observation that the decline in hat wearing has been accompanied by a general decline in the desire to wear formal clothing. For example, up through the 1950s, photos of crowds at sporting events show that, in contrast with today, many men not only wore hats (rather than caps) but also sports jackets or even suits, and most women wore dresses. Some people copy the fashions of celebrities they admire. By the 1960s, celebrities, such as the Beatles, Elvis Presley, and Paul Newman, were rarely photographed wearing hats, which may have contributed to the change in tastes.

Some people who have studied photographs, movies, and television shows believe that a slow decline in hat wearing that began in the 1930s sharply increased around 1960. One popular argument is that the decision of President John Kennedy to go hatless during his inauguration in January 1961 prompted many men to stop wearing hats. But careful inspection of photos from Kennedy's inauguration show that he actually wore a top hat throughout the day. He removed his hat only to deliver his inaugural address. The custom of removing your hat before giving a speech dated back to the 1800s, so Kennedy wasn't breaking with tradition.

Like other changes in tastes, the decline in hat wearing can't be easily explained.

Your Turn: Test your understanding by doing related problem 1.13 at the end of this chapter.

Demographics The characteristics of a population with respect to age, race, and gender.

Population and Demographics As the population of a country increases, the number of consumers will increase, as will the demand for most products. The **demographics** of a population refers to its characteristics with respect to age, race, and gender. As the demographics of a country or region change, the demand for particular goods will increase or decrease because different categories of people tend to have different preferences for those goods. For instance, the U.S. Census Bureau forecasts that Hispanics will increase from 19 percent of the U.S. population in 2021 to 28 percent in 2060. This increase will expand demand for Spanish-language books, websites, and streaming series, among other goods and services.

Apply the Concept

Millennials and Generation Z Shake Up the Markets for Groceries, Big Macs, and Water Bottles

Changing demographics can affect the demand for products. The usefulness of some products varies with age. For example, when birth rates are high, the demand for baby products such as formula and diapers increases. Similarly, when there are more older people, the demand for housing developments for seniors increases. Many retail analysts believe that *tastes* for products may also differ across generations, so that some products that are popular with older generations may be much less popular with younger generations. There are no exact definitions of generations, but the following table shows the definitions used by the Pew Research Center. The table also shows the U.S. Census Bureau's estimates of the population of each generation in 2022.

Years Born	Generation Label	Age Range in 2022	Number of People in the Generation in 2022
1946–1964	Baby boom generation	58–76	73 million
1965–1980	Generation X	42–57	65 million
1981–1996	Millennials	26–41	73 million
1997–2012	Generation Z	10–25	67 million

Lalandrew/Shutterstock

Millennials and generation Z are more likely than older generations to own reusable water bottles.

The population of millennials and generation Z together (140 million people) is slightly larger than the population of generation X and the baby boomers together (138 million people), but the size of each generation doesn't tell the whole story for retailers. Market research indicates that consumers between the ages of 18 and 49 account for a large fraction of all retail sales. This fact helps explain why firms are willing to pay high prices to run commercials on television programs, such as *The Bear* or *The Voice*, that this "prime demographic" watches. Note that the whole of the baby boom generation is now older than this demographic. Members of generation X are also beginning to age out of this group, and over time millennials and generation Z will begin to make up the bulk of this demographic.

Because of the importance of these generations as consumers, firms become concerned if generation Z and millennials don't have a strong demand for their products. For instance, only 20 percent of millennials have ever eaten a McDonald's Big Mac. Millennials and generation Z are more likely to visit "fast-casual" restaurants, such as Panera Bread or Chipotle, than fast-food restaurants, such as McDonald's or Burger King. Even long-time staples of the U.S. diet like canned tuna are not popular with younger generations. As the *Wall Street Journal* put it, "Canned tuna is struggling to connect with younger generations who favor fresher, less-processed options." A manager at StarKist, based in Pittsburgh, complained that "a lot of millennials don't even own can openers."

Firms that sell products strongly identified with baby boomers have particular difficulty selling to younger consumers. As Heather Malenshek, former Harley-Davidson vice president of marketing, put it, "The greatest challenge is to bring younger people into the sport" of riding motorcycles. Because millennials are having fewer children than previous generations, sales of diapers, baby formula, and similar products have declined. Kimberly-Clark was forced to lay off workers and close factories partly because demand for its Huggies diapers had declined.

People who are in the millennial generation and generation Z are more likely than other generations to be concerned about environmental issues. For instance, according to a Gallup poll, people in these generations are about twice as likely as baby boomers or people in generation X to agree with the statement "Global warming will pose a serious risk." Partly because of concern about the environmental effects of single-use bottled water, millennials and generation Z are more likely than older generations to own reusable water bottles. According to one survey, 74 percent of millennials own a water bottle. As one columnist put it: "These bottles are helping to save the planet—and millennials, in particular, can't get enough."

In addition, on average, millennials and generation Z are likely to have lower incomes than are older generations. That makes them more likely to benefit from the savings involved in owning reusable water bottles. One estimate puts the average savings at $800 per year.

Your Turn: Test your understanding by doing related problems 1.14 and 1.15 at the end of this chapter.

Expected Future Prices Consumers choose not only which products to buy but also when to buy them. For instance, if consumers believe that the prices of water bottles will be lower during the holiday season, the demand for water bottles will decrease in October, as some consumers postpone their purchases to wait for the expected price decrease. Alternatively, if enough consumers become convinced that the price of water bottles will be higher in June as people prepare for outdoor activities during the summer, the demand for water bottles may increase in the spring, as some consumers try to beat the expected price increase.

Natural disaster (in an economic context) A hurricane, flood, or similar act of nature that causes damage to stores, factories, or office buildings.

Pandemic (in an economic context) A situation in which a disease becomes sufficiently widespread as to significantly affect economic activity.

Natural Disasters and Pandemics A hurricane, tornado, flood, or other **natural disaster** can temporarily disrupt economic activity in a region, causing the demand curves for most goods and services to shift to the left. The demand for a few products may increase, as happens when people stock up on bottled water and other essentials and buy electric generators when a hurricane is forecast. The demand curve for these products would shift to the right.

Most natural disasters affect only one particular region, but a **pandemic**, such as the Covid–19 pandemic, affects the entire U.S. economy. The effects of a pandemic also last much longer than is true of most natural disasters. During the Covid–19 pandemic, the demand curves for services that people experience together indoors shifted to the left. Particularly hard hit were restaurants, movie theaters, gyms, and sports arenas. As people adjusted to spending more time at home, including remotely working or taking classes, the demand curves for some products shifted to the right, including disinfectant wipes and hand sanitizers, flour and baking yeast, laptop computers, and video communication software such as Zoom.

Table 3.1 summarizes the most important variables that cause market demand curves to shift. Note that the table shows the shift in the demand curve that results from an *increase* in each of the variables. A *decrease* in these variables would cause the demand curve to shift in the opposite direction.

A Change in Demand versus a Change in Quantity Demanded

It is important to understand the difference between a *change in demand* and a *change in quantity demanded*. A change in demand refers to a shift of the demand curve. A shift occurs if there is a change in one of the variables—*other than the price of the product*—that affects the willingness of consumers to buy the product. A change in quantity demanded refers to a movement along the demand curve as a result of a change in the product's price. Figure 3.3 illustrates this important distinction. If the price of water bottles falls from \$30 to \$25, the result will be a movement along the demand curve from point *A* to point *B*—an increase in quantity demanded from 3 million bottles per week to 4 million.

Figure 3.3

A Change in Demand versus a Change in Quantity Demanded

If the price of water bottles falls from \$30 to \$25, the result will be a movement along the demand curve from point *A* to point *B*—an increase in quantity demanded from 3 million bottles per week to 4 million bottles. If consumers' incomes increase, or if another factor changes that makes consumers want more of the product at every price, the demand curve will shift to the right—an increase in demand. In this case, the increase in demand from D_1 to D_2 causes the quantity of water bottles demanded at a price of \$30 to increase from 3 million bottles at point *A* to 5 million bottles at point *C*.

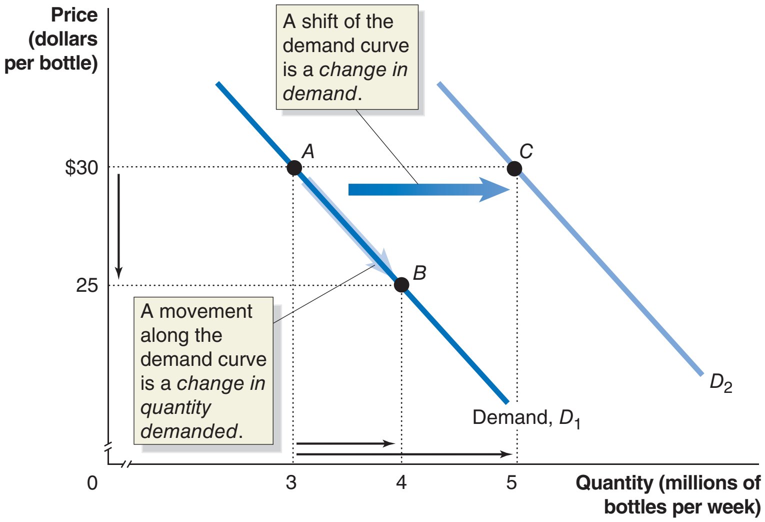
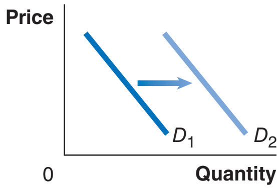
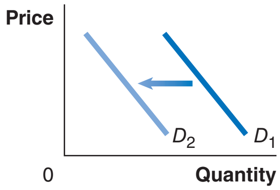
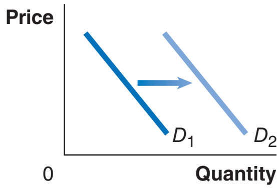
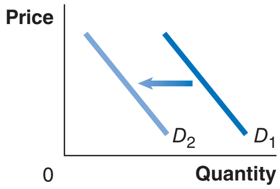
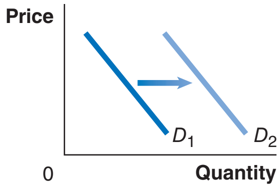
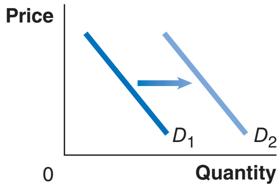
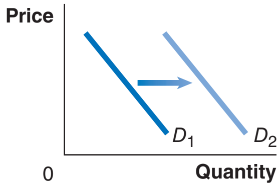
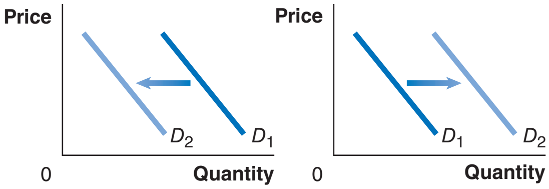


Table 3.1 Variables That Shift Market Demand Curves

An ...	shifts the demand curve ...	because ...
increase in income (and the good is normal)		consumers spend more of their higher incomes on the good.
increase in income (and the good is inferior)		consumers spend less of their higher incomes on the good.
increase in the price of a substitute good		consumers buy less of the substitute good and more of this good.
increase in the price of a complementary good		consumers buy less of the complementary good and less of this good.
increase in the taste for the good		consumers are willing to buy a larger quantity of the good at every price.
increase in population		additional consumers result in a greater quantity demanded at every price.
increase in the expected price of the good in the future		consumers buy more of the good today to avoid the higher price in the future.
occurrence of a natural disaster or pandemic		consumers buy less of most goods but more of a few goods.

If consumers' incomes increase, or if another factor changes that makes consumers want more of the product at every price, the demand curve will shift to the right—an increase in demand. In this case, the increase in demand from D_1 to D_2 causes the quantity of water bottles demanded at a price of $30 to increase from 3 million bottles at point *A* to 5 million bottles at point *C*.

3.2 The Supply Side of the Market

LEARNING OBJECTIVE: List and describe the variables that influence supply.

Quantity supplied The amount of a good or service that a firm is willing and able to supply at a given price.

Just as many variables influence the willingness and ability of consumers to buy a particular good or service, many variables influence the willingness and ability of firms to supply a good or service. The most important of these variables is price. The amount of a good or service that a firm is willing and able to supply at a given price is the **quantity supplied**. Holding other variables constant, when the price of a good rises, producing the good is more profitable, and the quantity supplied will increase. When the price of a good falls, selling the good is less profitable, and the quantity supplied will decrease. In addition, as we saw in Chapter 2, devoting more and more resources to the production of a good results in increasing marginal costs. For example, if Hydro Flask, Yeti, Tritan, S'well, and other firms increase production of water bottles during a given time period, they are likely to find that the cost of producing additional bottles increases as they run existing factories for longer hours and pay higher prices to ship water bottles from factories, many of which are located in Asia, to markets in North America and Europe. With higher marginal costs, firms will supply a larger quantity only if the price is higher.

Supply Schedules and Supply Curves

Supply schedule A table that shows the relationship between the price of a product and the quantity of the product supplied.

Supply curve A curve that shows the relationship between the price of a product and the quantity of the product supplied.

A **supply schedule** is a table that shows the relationship between the price of a product and the quantity of the product supplied. The table in Figure 3.4 is a supply schedule showing the quantity of water bottles that firms would be willing to supply per week at different prices. The graph in Figure 3.4 plots the numbers from the table as a **supply curve**, which shows the relationship between the price of a product and the quantity of the product supplied. The supply schedule and supply curve both show that as the price of water bottles rises, firms will increase the quantity they supply. At a price of $25 per bottle, firms will supply 6 million bottles per week. At a higher price of $30, firms will supply 7 million bottles. (Once again, we are assuming for convenience that the supply curve is a straight line, even though not all supply curves are actually straight lines.)

Supply Schedule	
Price (dollars per bottle)	Quantity (millions of bottles per week)
$30	7
25	6
20	5
15	4
10	3

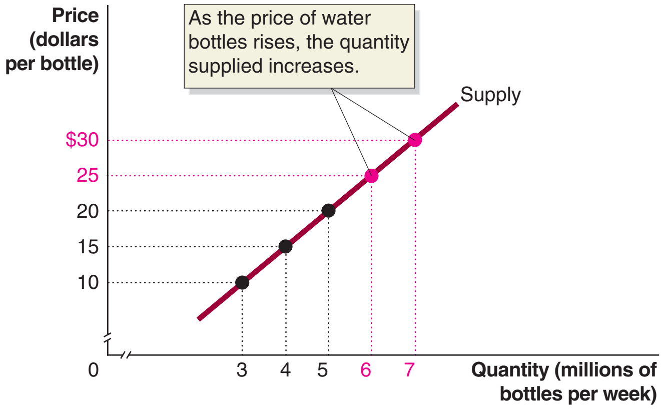


Figure 3.4 **A Supply Schedule and Supply Curve**

As the price of water bottles changes, Hydro Flask, Yeti, Tritan, S'well, and other firms change the quantity they are willing to supply. We can show this as a *supply schedule* in a table or as a *supply curve* on a graph. The supply schedule and supply curve both show that as the price of water bottles rises, firms will increase the quantity they supply. At a price of $25 per bottle, firms will supply 6 million bottles per week. At a price of $30, firms will supply 7 million bottles.

The Law of Supply

The *market supply curve* in Figure 3.4 is upward sloping. We expect most supply curves to be upward sloping, according to the **law of supply**, which states that, holding everything else constant, increases in price cause increases in the quantity supplied, and decreases in price cause decreases in the quantity supplied. Notice that the definition of the law of supply—like the definition of the law of demand—contains the phrase *holding everything else constant*. If only the price of the product changes, there is a movement along the supply curve, which is *an increase or a decrease in the quantity supplied*. As Figure 3.5 shows, if any other variable that affects the willingness of firms to supply a good changes, the supply curve will shift, which is *an increase or a decrease in supply*. When firms increase the quantity of a product they want to sell at a given price, the supply curve shifts to the right. The shift from S_1 to S_3 represents *an increase in supply*. When firms decrease the quantity of a product they want to sell at a given price, the supply curve shifts to the left. The shift from S_1 to S_2 represents *a decrease in supply*.

Law of supply A rule that states that, holding everything else constant, increases in price cause increases in the quantity supplied, and decreases in price cause decreases in the quantity supplied.

Variables That Shift Market Supply

Many variables other than price can affect market supply. These six are the most important:

- Prices of inputs
- Technological change
- Prices of related goods in production
- Number of firms in the market
- Expected future prices
- Natural disasters and pandemics

We next discuss how changes in each of these variables affect the market supply curve.

Prices of Inputs The factor most likely to cause the supply curve for a product to shift is a change in the price of an input. An *input* is anything used in the production of a good or service. For instance, if the price of plastic used in many water bottles rises, the cost of producing water bottles will increase, making supplying them less profitable at every price. The supply of water bottles will decline, and the market supply curve will shift to the left. Similarly, if the price of an input falls, the supply of water bottles will increase, and the market supply curve will shift to the right.

Technological Change A second factor that causes a change in supply is **technological change**, which is a positive or negative change in the ability of a firm to produce a given level of output with a given quantity of inputs. Positive technological

Technological change A positive or negative change in the ability of a firm to produce a given level of output with a given quantity of inputs.

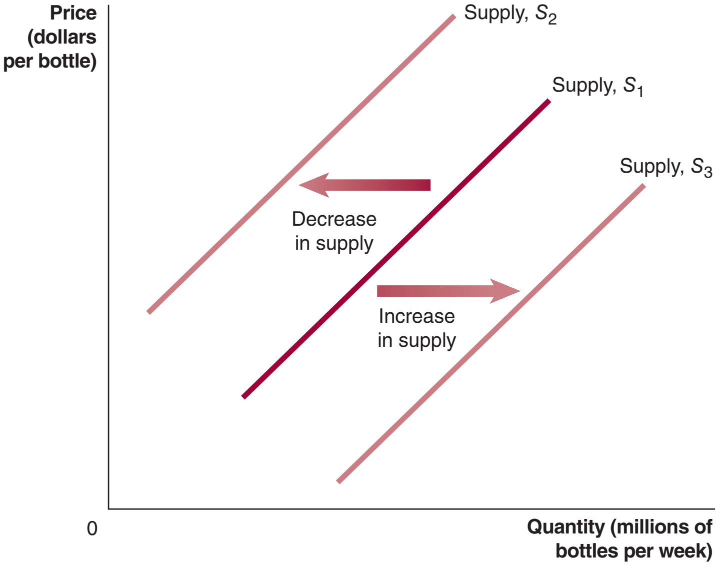


Figure 3.5

Shifting the Supply Curve

When firms increase the quantity of a product they want to sell at a given price, the supply curve shifts to the right. The shift from S_1 to S_3 represents an *increase in supply*. When firms decrease the quantity of a product they want to sell at a given price, the supply curve shifts to the left. The shift from S_1 to S_2 represents a *decrease in supply*.

change occurs whenever a firm is able to produce more output using the same quantity of inputs. In other words, the *productivity* of the firm's workers or machines has increased. For example, suppose that the managers of Hydro Flask's factories improve the flow of materials through the factories so that they can produce more bottles per week, using the same number of workers and quantity of machinery. If a firm can produce more output with the same quantity of inputs, its costs will be lower, and the good will be more profitable to produce at any given price. As a result, when positive technological change occurs, the firm will increase the quantity supplied at every price, and its supply curve will shift to the right.

Negative technological change is relatively rare, although it could result, for instance, from a war that reduces the ability of firms in that country or region to supply as much output with a given amount of inputs. Negative technological change will raise firms' costs, and firms will earn lower profits from producing the good, causing the market supply curve to shift to the left.

Prices of Related Goods in Production Firms often choose which good or service they will produce. Alternative goods that a firm could produce are called *substitutes in production*. Many of the factories that produce plastic water bottles also produce other plastic goods. If the price of bottles used for spring water decreases relative to the price of reusable plastic water bottles, bottles used for spring water will become less profitable, and firms will shift some of their productive capacity away from those bottles and toward reusable plastic water bottles. Firms will offer more water bottles at every price, so the supply curve for water bottles will shift to the right.

Goods that are produced together are called *complements in production*. For example, the same geological formations that contain oil usually also contain natural gas. If the price of oil rises, oil companies that begin pumping more oil from these formations will also produce more natural gas. As a result, an increase in the price of oil will cause the supply curve for natural gas—a complement in production—to shift to the right.

Number of Firms in the Market A change in the number of firms in the market will change supply. When new firms *enter* a market, the supply curve shifts to the right, and when existing firms leave, or *exit*, a market, the supply curve shifts to the left. For instance, when Yeti entered the water bottle market, more water bottles were supplied at every price, so the market supply curve for water bottles shifted to the right.

Expected Future Prices If a firm expects that the price of its product will be higher in the future, it has an incentive to decrease supply now and increase it in the future. For instance, if managers at Hydro Flask believe that prices for water bottles are temporarily low—perhaps because of a recession—it may store some of its production of today to sell later on, when it expects prices to be higher.

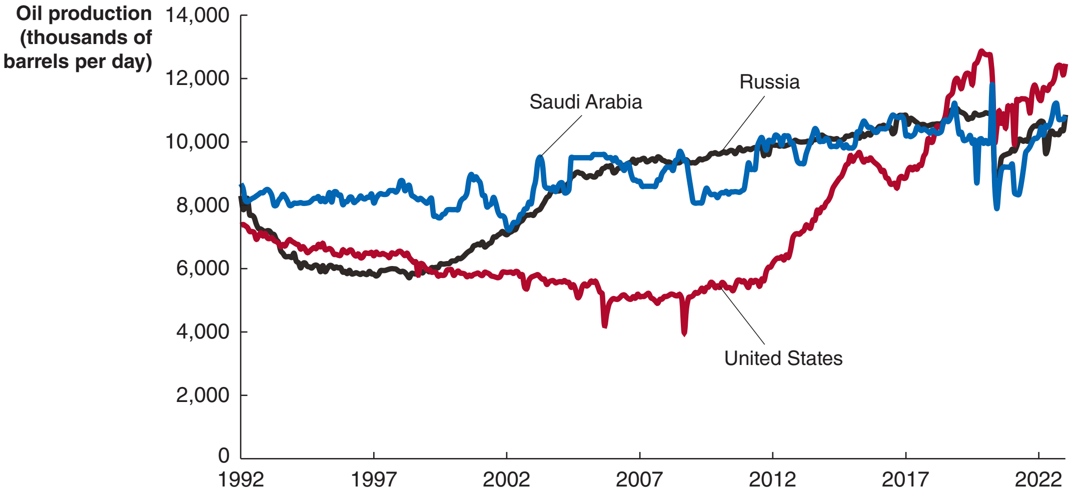
Natural Disasters and Pandemics During a natural disaster such as a hurricane or flood, some stores, factories, and office buildings will be damaged. During a pandemic like the Covid–19 pandemic that began in 2020, government social distancing regulations may keep people from working in stores, factories, or offices. As a result, in both natural disasters and pandemics, some firms will only be able to produce a smaller quantity of goods or services at every price, shifting the supply curve to the left.

Apply the Concept

Fracking, the U.S. Oil Boom, and Expected Oil Prices

For many firms, changes in expected future prices don't have a large effect on the quantity of the good they supply. Although water bottle manufacturers can reduce the supply of bottles by holding them temporarily as *inventories*, typically the quantities involved are small. The situation is quite different for U.S. oil producers.

When U.S. oil firms developed hydraulic fracturing, or *fracking*, in drilling for oil, they disrupted the world oil market. Fracking involves pumping a mixture of water, sand,



and chemicals into shale rock formations that contain oil and natural gas that firms had previously not been able to recover profitably. The graph shows that as a result of fracking, by 2018, the United States had surpassed Saudi Arabia and Russia to become the largest oil producer in the world.

The graph also shows a 10 percent reduction in U.S. oil production between early 2015 and mid-2016. The reduction was due to a decline in the price of oil from almost $98 per barrel in 2013 to $43 per barrel in 2016. Similarly, as a result of the Covid–19 pandemic, oil prices dropped sharply from $53 per barrel in February 2020 to $3 per barrel only two months later. In response, oil production dropped by 20 percent. We would expect a decline in price to cause a reduction in the quantity supplied as a result of a movement down the supply curve. But, in addition, during both 2016 and 2020, the supply curve for oil shifted to the left because oil producers predicted that oil prices would increase in the future. Those predictions turned out to be correct.

When oil-producing firms expect that prices for oil will increase in the future, they can respond by withholding oil from the market in several ways: (1) They can reduce the quantity of oil they pump, in effect storing it in the ground until prices increase; (2) they can pump oil and store it until prices rise (stocks of oil in the United States increased more than 20 percent between early 2014 and mid-2016 and by more than 25 percent in mid-2020); and (3) they can store oil, or products like gasoline that are refined from oil, on supertankers, which are capable of holding millions of barrels of oil, as they wait for prices to rise. During 2022, we again witnessed this pattern of the quantity of oil being stored rising and falling in response to fluctuations in prices: Oil prices rose sharply during the first half of the year and then declined during the second half of the year.

Because oil firms have a variety of ways to store oil during periods of low prices, oil production is more sensitive to firms' expectations of future prices than is the production of most other products.

Your Turn: Test your understanding by doing related problem 2.5 at the end of this chapter.

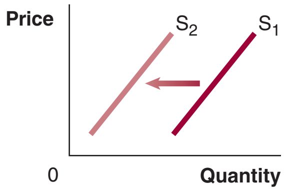
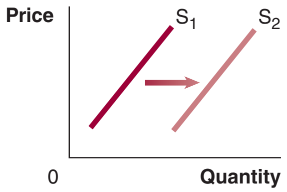
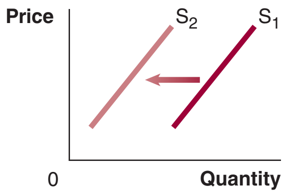
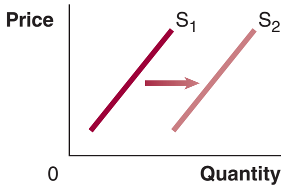
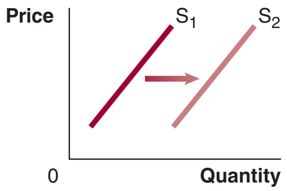
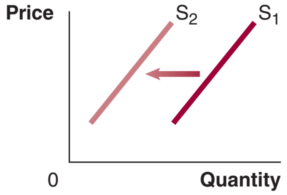
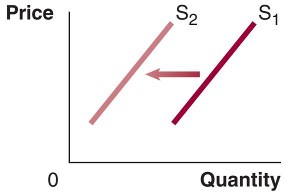
Table 3.2 summarizes the most important variables that cause market supply curves to shift. Note that the table shows the shift in the supply curve that results from an *increase* in each of the variables. A *decrease* in these variables would cause the supply curve to shift in the opposite direction.

A Change in Supply versus a Change in Quantity Supplied

We noted in Section 3.1 the important difference between a change in demand and a change in quantity demanded. There is a similar difference between a *change in supply* and a *change in quantity supplied*. A change in supply refers to a shift of the supply curve.

Table 3.2

Variables That Shift Market Supply Curves

An ...	shifts the supply curve ...	because ...
increase in the price of an input		the costs of producing the good rise.
increase in productivity		the costs of producing the good fall.
increase in the price of a substitute in production		more of the substitute is produced and less of the good is produced.
increase in the price of a complement in production		more of the good and the complementary good are produced.
increase in the number of firms in the market		additional firms result in a greater quantity supplied at every price.
increase in the expected future price of the product		less of the good will be offered for sale today to take advantage of the higher price in the future.
occurrence of a natural disaster or pandemic		less of the good will be supplied because of disruptions in production.

The supply curve will shift when there is a change in one of the variables—*other than the price of the product*—that affects the willingness of suppliers to sell the product. A change in quantity supplied refers to a movement along the supply curve as a result of a change in the product's price. Figure 3.6 illustrates this important distinction. If the price of water bottles increases from \$25 to \$30, the result will be a movement up the supply curve from point *A* to point *B*—an increase in quantity supplied from 6 million bottles per

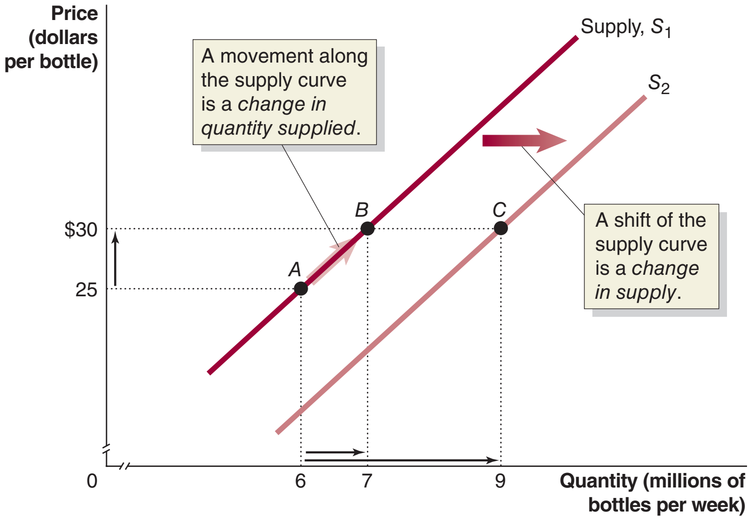


Figure 3.6

A Change in Supply versus a Change in Quantity Supplied

If the price of reusable water bottles rises from $25 to $30, the result will be a movement up the supply curve from point *A* to point *B*—an increase in the quantity supplied by Hydro Flask, Yeti, Tritan, S'well, and other firms from 6 million bottles per week to 7 million bottles. If the price of an input decreases, or if another factor changes that causes sellers to supply more of the product at every price, the supply curve will shift to the right—an increase in supply. In this case, the increase in supply from S_1 to S_2 causes the quantity of water bottles supplied at a price of $30 to increase from 7 million bottles at point *B* to 9 million bottles at point *C*.

week to 7 million bottles. If the price of an input decreases, or if another factor changes that causes sellers to supply more of a product at every price, the supply curve will shift to the right—an increase in supply. In this case, the increase in supply from S_1 to S_2 causes the quantity of water bottles supplied at a price of $30 to increase from 7 million bottles at point *B* to 9 million bottles at point *C*.

3.3 Market Equilibrium: Putting Demand and Supply Together

LEARNING OBJECTIVE: Use a graph to illustrate market equilibrium.

The purpose of markets is to bring together buyers and sellers. As we saw in Chapter 2, instead of being chaotic and disorderly, the interaction of buyers and sellers in markets ultimately results in firms being led to produce the goods and services that consumers want most. To understand this process, we first need to see how markets work to reconcile the plans of buyers and sellers.

In Figure 3.7, we bring together the market demand curve and the market supply curve for water bottles. Notice that the demand curve crosses the supply curve at only one point. This point represents a price of $20 and a quantity of 5 million bottles per week.

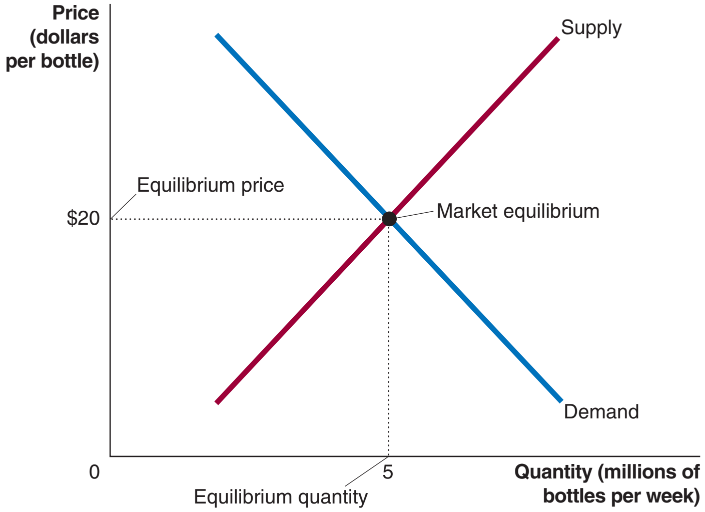


Figure 3.7

Market Equilibrium

Market equilibrium occurs where the demand curve crosses the supply curve. In this case, the demand curve for water bottles crosses the supply curve at a price of $20 and a quantity of 5 million bottles. Only at this point is the quantity of water bottles consumers are willing to buy equal to the quantity that Hydro Flask, Yeti, Tritan, S'well, and other firms are willing to sell: The quantity demanded is equal to the quantity supplied.

Market equilibrium A situation in which quantity demanded equals quantity supplied.

Competitive market equilibrium A market equilibrium with many buyers and sellers.

Only at this point of **market equilibrium** is the quantity of water bottles consumers are willing and able to buy equal to the quantity of water bottles firms are willing and able to sell. In this case, the *equilibrium price* is $20, and the *equilibrium quantity* is 5 million bottles. As we noted at the beginning of the chapter, markets that have many buyers and sellers are competitive markets, and equilibrium in such markets is called **competitive market equilibrium**. In the market for water bottles, there are millions of buyers but only about 100 firms. Whether 100 firms are enough for our model of demand and supply to apply to this market is a matter of judgment. In this chapter, we are assuming that the market for water bottles has enough sellers to be competitive.

How Markets Eliminate Surpluses and Shortages

Surplus A situation in which the quantity supplied is greater than the quantity demanded.

Shortage A situation in which the quantity demanded is greater than the quantity supplied.

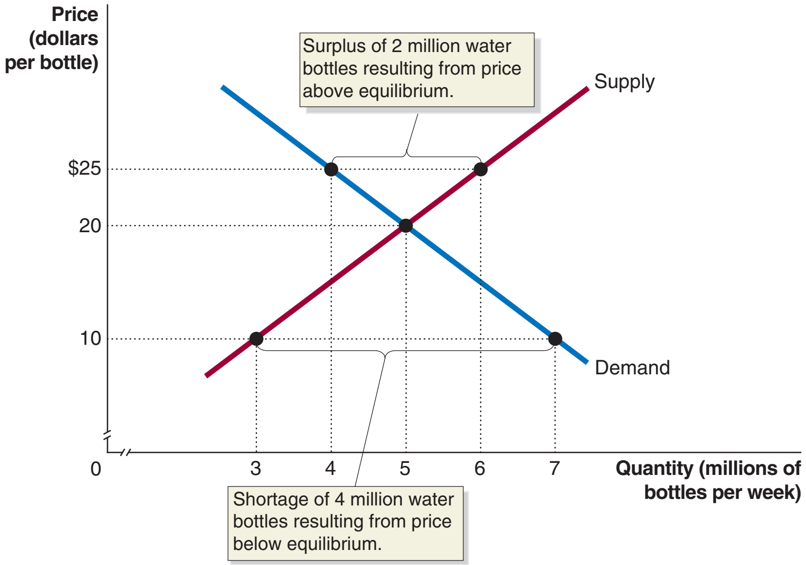
A market that is not in equilibrium moves toward equilibrium. Once a market is in equilibrium, it remains in equilibrium. To see why, consider what happens if a market is not in equilibrium. Suppose that the price in the market for water bottles were $25 rather than the equilibrium price of $20. As Figure 3.8 shows, at a price of $25, the quantity of water bottles supplied would be 6 million bottles, and the quantity of water bottles demanded would be 4 million bottles. When the quantity supplied is greater than the quantity demanded, there is a **surplus** in the market. In this case, the surplus is equal to 2 million bottles (6 million − 4 million = 2 million). When there is a surplus, firms will have unsold goods piling up, which gives them an incentive to increase their sales by cutting the price. Cutting the price will simultaneously increase the quantity demanded and decrease the quantity supplied. This adjustment will reduce the surplus, but as long as the price is above $20, there will still be a surplus, and downward pressure on the price will continue. Only when the price falls to $20 will the market be in equilibrium.

If, however, the price were $10, the quantity demanded would be 7 million bottles, and the quantity supplied would be 3 million, as shown in Figure 3.8. When the quantity demanded is greater than the quantity supplied, there is a **shortage** in the market. In this case, the shortage is equal to 4 million bottles (7 million − 3 million = 4 million). When a shortage occurs, some consumers will be unable to buy water bottles at the current price. In this situation, firms will realize that they can raise the price without losing sales. A higher price will simultaneously increase the quantity supplied and decrease the quantity demanded. This adjustment will reduce the shortage, but as long as the price is below $20, there will still be a shortage, and upward pressure on the price will continue. Only when the price rises to $20 will the market be in equilibrium.

Figure 3.8

The Effect of Surpluses and Shortages on the Market Price

When the market price is above equilibrium, there will be a *surplus*. A price of $25 for water bottles results in 6 million bottles being supplied but only 4 million bottles being demanded, or a surplus of 2 million bottles. As Hydro Flask, Yeti, Tritan, S'well, and other firms cut the price to dispose of the surplus, the price will fall to the equilibrium price of $20. When the market price is below equilibrium, there will be a *shortage*. A price of $10 results in 7 million bottles being demanded but only 3 million being supplied, or a shortage of 4 million. As firms find that consumers who are unable to find water bottles available for sale are willing to pay higher prices to get them, the price will rise to the equilibrium price of $20.



Surplus of 2 million water bottles resulting from price above equilibrium.

Shortage of 4 million water bottles resulting from price below equilibrium.

At a competitive market equilibrium, all consumers willing to pay the market price will be able to buy as much of the product as they want, and all firms willing to accept the market price will be able to sell as much of the product as they want. As a result, there will be no reason for the price to change unless either the demand curve or the supply curve shifts.

Demand and Supply Both Count

Keep in mind that the interaction of demand and supply determines the equilibrium price. Neither consumers nor firms can dictate what the equilibrium price will be. No firm can sell anything at any price unless it can find a willing buyer, and no consumer can buy anything at any price without finding a willing seller.

Solved Problem 3.3

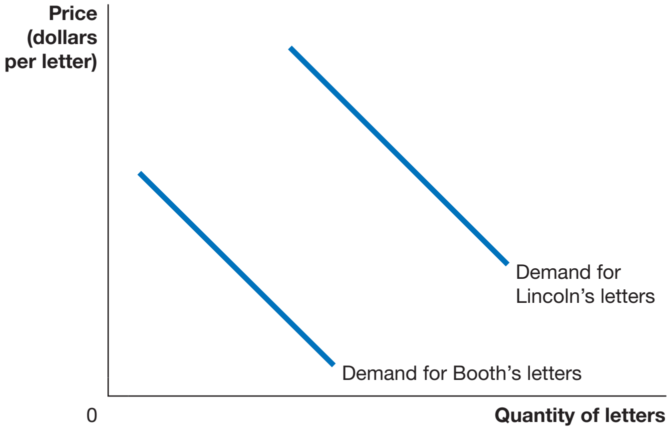
Demand and Supply Both Count: A Tale of Two Letters

Which letter is likely to be worth more: one written by Abraham Lincoln or one written by his assassin, John Wilkes Booth? Lincoln is one of the greatest presidents, and many people collect anything he wrote. The demand for letters written by Lincoln surely would seem to be much greater than the demand for letters written by Booth. Yet, when R.M. Smythe and Co. auctioned off on the same day a letter written by Lincoln and a letter written by Booth, the Booth letter sold for $31,050, and the Lincoln letter sold for only $21,850. Use a demand and supply graph to explain how the Booth letter has a higher market price than the Lincoln letter, even though the demand for letters written by Lincoln is greater than the demand for letters written by Booth.

Solving the Problem

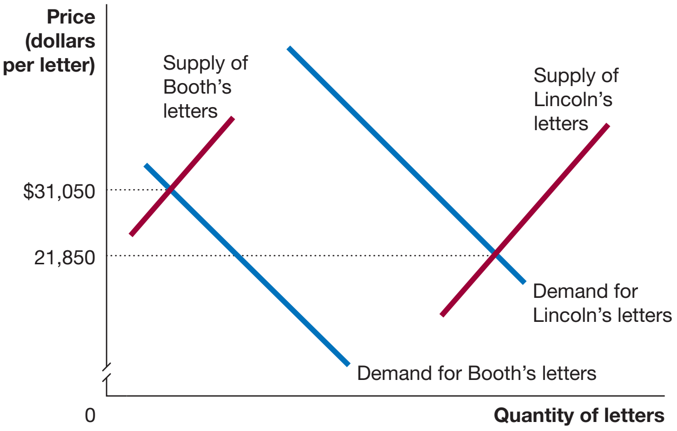
Step 1: **Review the chapter material.** This problem is about prices being determined at market equilibrium, so you may want to review the section "Market Equilibrium: Putting Demand and Supply Together."

Step 2: **Draw demand curves that illustrate the greater demand for Lincoln's letters.** Begin by drawing two demand curves. Label one "Demand for Lincoln's letters" and the other "Demand for Booth's letters." Make sure that the Lincoln demand curve is much farther to the right than the Booth demand curve.



Step 3: **Draw supply curves that illustrate the equilibrium price of Booth's letters being higher than the equilibrium price of Lincoln's letters.** Based on the demand curves you have just drawn, think about how it might be possible for the market price of Lincoln's letters to be lower than the market price of Booth's letters. This outcome can occur only if the supply of Lincoln's letters is much greater than the supply of Booth's letters. Draw on your graph a supply

curve for Lincoln's letters and a supply curve for Booth's letters that will result in an equilibrium price of Booth's letters of $31,050 and an equilibrium price of Lincoln's letters of $21,850. You have now solved the problem.



Extra Credit: The explanation for this puzzle is that both demand and supply count when determining market price. The demand for Lincoln's letters is much greater than the demand for Booth's letters, but the supply of Booth's letters is very small. Historians believe that only eight letters written by Booth exist today. (Note that the supply curves for letters written by Booth and by Lincoln are upward sloping, even though only a fixed number of each of these letters is available and, obviously, no more can be produced. The upward slope of the supply curves occurs because the higher the price, the larger the quantity of letters that will be offered for sale by people who currently own them.)

Your Turn: For more practice, do related problems 3.7, 3.8, and 3.9 at the end of this chapter.

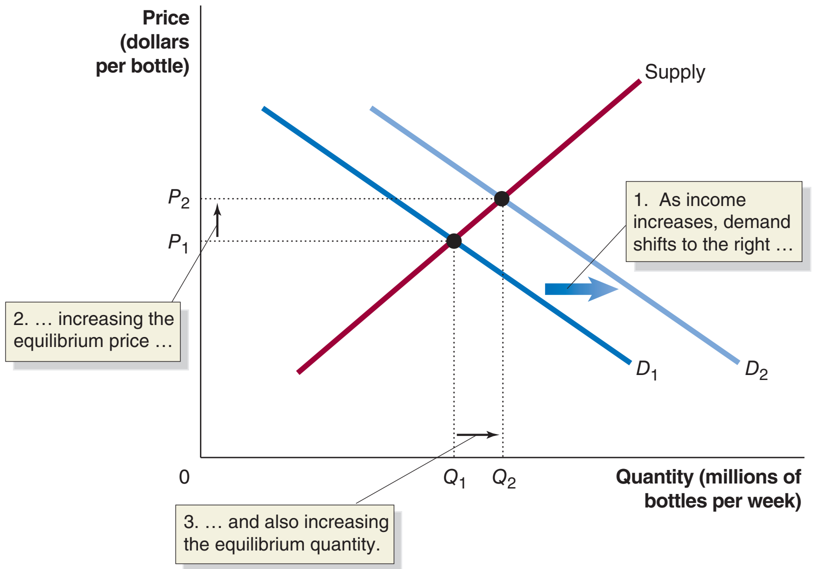
3.4 The Effect of Demand and Supply Shifts on Equilibrium

LEARNING OBJECTIVE: Use demand and supply graphs to predict changes in prices and quantities.

We have seen that the interaction of demand and supply in markets determines the quantity of a good that is produced and the price at which it is sold. We have also seen that several variables cause demand curves to shift and other variables cause supply curves to shift. As a result, demand and supply curves in most markets are constantly shifting, and the prices and quantities that represent equilibrium are constantly changing. In this section, we look at how shifts in demand and supply curves affect equilibrium price and quantity.

The Effect of Shifts in Demand on Equilibrium

Because water bottles are a normal good, when incomes increase, the market demand curve shifts to the right. Figure 3.9 shows the effect of a demand curve shifting to the right, from D_1 to D_2. This shift causes a shortage at the original equilibrium price, P_1. To eliminate the shortage, the equilibrium price rises to P_2, and the equilibrium quantity rises from Q_1 to Q_2. In contrast, if the price of a substitute good, such as bottled spring water, were to fall, the demand for water bottles would decrease, shifting the demand curve to the left. When the demand curve shifts to the left, both the equilibrium price and quantity will decrease.



1. As income increases, demand shifts to the right …

2. … increasing the equilibrium price …

3. … and also increasing the equilibrium quantity.

Figure 3.9

The Effect of an Increase in Demand on Equilibrium

Increases in income will cause the equilibrium price and quantity to rise:

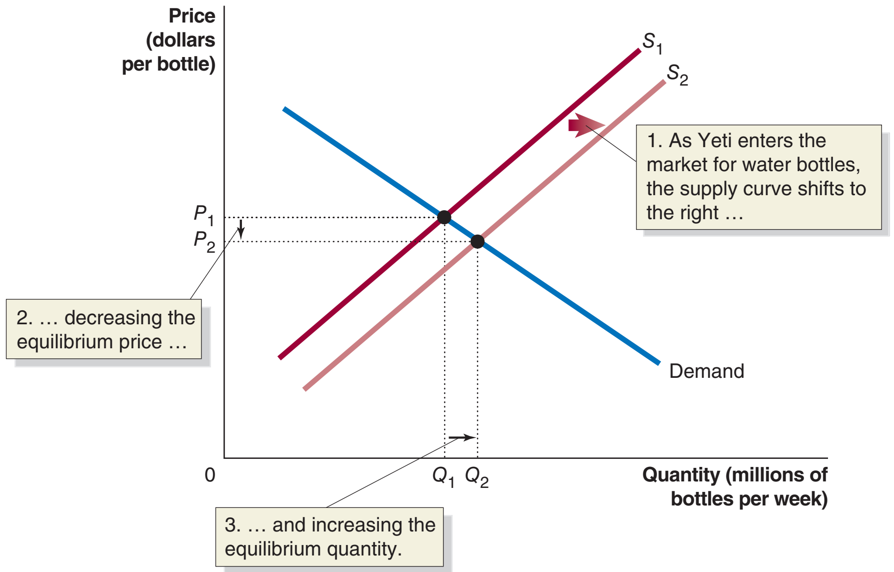
1. Because water bottles are a normal good, as income increases, the quantity demanded increases at every price, and the market demand curve shifts to the right, from D_1 to D_2, which causes a shortage at the original price, P_1.
2. The equilibrium price rises from P_1 to P_2.
3. The equilibrium quantity rises from Q_1 to Q_2.

The Effect of Shifts in Supply on Equilibrium

When Yeti entered the market for water bottles, the market supply curve for water bottles shifted to the right. Figure 3.10 shows the supply curve shifting from S_1 to S_2. When the supply curve shifts to the right, there will be a surplus at the original equilibrium price, P_1. The surplus is eliminated as the equilibrium price falls to P_2 and the equilibrium quantity rises from Q_1 to Q_2. If an existing firm exits the market, the supply curve will shift to the left, causing the equilibrium price to rise and the equilibrium quantity to fall.

The Effect of Shifts in Demand and Supply over Time

Whenever only demand or only supply shifts, we can easily predict the effect on equilibrium price and quantity. But, what happens if *both* curves shift? For instance, in many markets, the demand curve shifts to the right over time as population and income increase. The supply curve also often shifts to the right as new firms enter the market and positive technological change occurs. Whether the equilibrium price in a market rises or falls over time depends on whether demand shifts to the right more than does supply. Panel (a) of Figure 3.11 shows that when demand shifts to the right more than supply, the equilibrium price rises, while panel (b) shows that when supply shifts to the right more than demand, the equilibrium price falls.



1. As Yeti enters the market for water bottles, the supply curve shifts to the right …

2. … decreasing the equilibrium price …

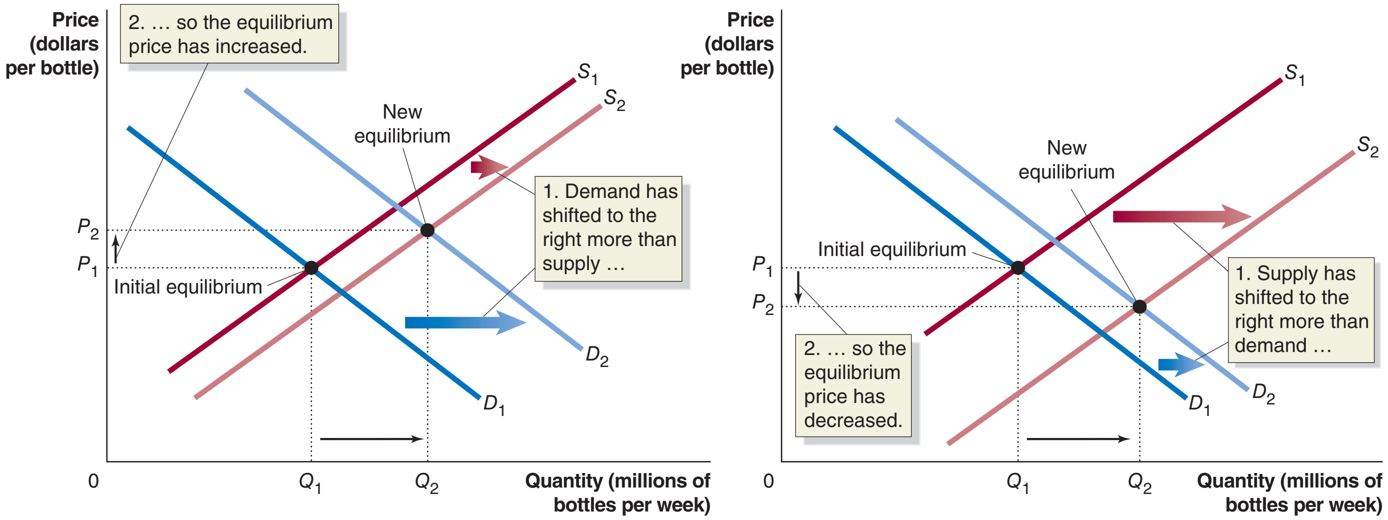
3. … and increasing the equilibrium quantity.

Figure 3.10

The Effect of an Increase in Supply on Equilibrium

If a firm enters a market, as Yeti entered the market for water bottles, the equilibrium price will fall, and the equilibrium quantity will rise:

1. As Yeti enters the market, a larger quantity of water bottles is supplied at every price, so the market supply curve shifts to the right, from S_1 to S_2, which causes a surplus at the original price, P_1.
2. The equilibrium price falls from P_1 to P_2.
3. The equilibrium quantity rises from Q_1 to Q_2.



(a) Demand shifting more than supply

(b) Supply shifting more than demand

Figure 3.11 **Shifts in Demand and Supply over Time**

Whether the price of a product rises or falls over time depends on whether demand shifts to the right more than supply.

In panel (a):

1. Demand shifts to the right more than supply.
2. The equilibrium price rises from P_1 to P_2.

In panel (b):

1. Supply shifts to the right more than demand.
2. The equilibrium price falls from P_1 to P_2.

Table 3.3 summarizes all possible combinations of shifts in demand and supply over time and the effects of the shifts on equilibrium price (*P*) and quantity (*Q*). For example, the entry in red in the table shows that if the demand curve shifts to the right and the supply curve also shifts to the right, the equilibrium quantity will increase, while the equilibrium price may increase, decrease, or remain unchanged. To make sure you understand each entry in the table, draw demand and supply graphs to check whether you can reproduce the predicted changes in equilibrium price and quantity. If the entry in Table 3.3 indicates that the equilibrium price or quantity can increase, decrease, or remain unchanged, draw three graphs similar to panels (a) or (b) of Figure 3.11—one showing the equilibrium price or quantity increasing, one showing it decreasing, and one showing it unchanged.

Shifts in a Curve versus Movements along a Curve

When analyzing markets using demand and supply curves, remember that *when a shift in a demand or supply curve causes a change in equilibrium price, the change in price does not cause a further shift in demand or supply*. Suppose that an increase in supply causes the price of a good

Table 3.3

How Shifts in Demand and Supply Affect Equilibrium Price (*P*) and Quantity (*Q*)

The entry in red shows that if the demand curve shifts to the right and the supply curve also shifts to the right, the equilibrium quantity will increase, while the equilibrium price may increase, decrease, or remain unchanged.

	Supply Curve Unchanged	Supply Curve Shifts to the Right	Supply Curve Shifts to the Left
Demand curve unchanged	*Q* unchanged *P* unchanged	*Q* increases *P* decreases	*Q* decreases *P* increases
Demand curve shifts to the right	*Q* increases *P* increases	*Q* increases *P* increases, decreases, or is unchanged	*Q* increases, decreases, or is unchanged *P* increases
Demand curve shifts to the left	*Q* decreases *P* decreases	*Q* increases, decreases, or is unchanged *P* decreases	*Q* decreases *P* increases, decreases, or is unchanged

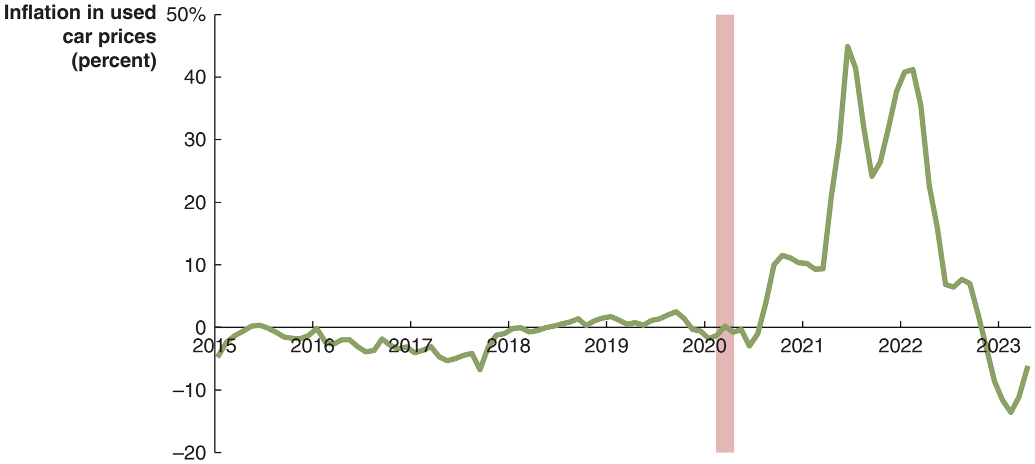
to fall, while everything else that affects the willingness of consumers to buy the good is constant. The result will be an increase in the quantity demanded but not an increase in demand. For demand to increase, the whole curve must shift. The point is the same for supply: If the price of the good falls but everything else that affects the willingness of sellers to supply the good is constant, the quantity supplied decreases, but the supply does not. For supply to decrease, the whole curve must shift.

Apply the Concept

Sticker Shock in the Market for Used Cars

Inflation during the 1970s was so high that anyone who hadn't bought a car for several years experienced "sticker shock"—a popular term for the surprise buyers felt at the jump in car prices. Beginning in the summer of 2020, sticker shock returned, particularly to the used car market. Prices were increasing so rapidly that even people who had purchased a car only a year or two before were surprised by the increases.

Each month, the U.S. Bureau of Labor Statistics (BLS) compiles the consumer price index (CPI), which is a measure of the prices of the goods and services purchased by the typical consumer. We can calculate the inflation rate as the percentage change in the CPI from the same month in the previous year. The following figure shows BLS data on the inflation rate in only the prices for used cars and trucks in the months between January 2015 and April 2023. (The shaded area represents the months of the 2020 recession.) Used car prices began rising in August 2020, with inflation in used car prices peaking at a 45 percent annual increase in June 2021. Monthly inflation in used car prices remained above 20 percent through April 2022. In the following months, price increases slowed and began to fall beginning in November 2022 and continuing through the spring of 2023. Inflation in used car prices being at such high rates for more than a year is something rarely seen in any of the components of the CPI.



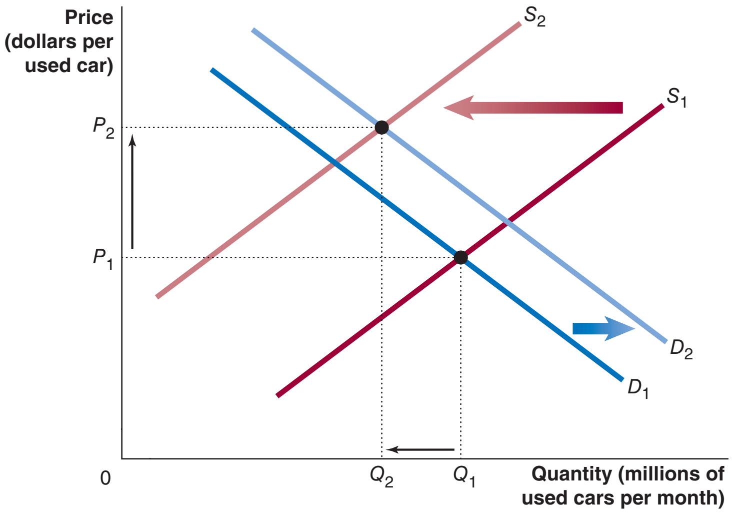
Three factors help explain the extraordinary burst of inflation in used car prices beginning in the summer of 2020:

1. A decline in the supply of new cars resulting from a shortage in semiconductors caused an increase in new car prices. Rising new car prices led some consumers who would otherwise have bought new cars to enter the used car market, increasing the demand for used cars.
2. During the Covid–19 pandemic, some people became reluctant to ride buses and other mass transit, increasing the demand for both new and used cars.
3. As the pandemic increased in severity in the spring of 2020, most rental car companies purchased fewer new cars for their fleets. After keeping a car in its fleet for

one year, a rental car company typically sells the car to a used car dealer for resale. Because rental car companies were selling them fewer cars, used car dealers had fewer cars on their lots. So, the supply of used cars declined.

We can use the demand and supply model to explain the jump in used car prices. As shown in the following figure:

1. The demand curve for used cars shifted to the right, from D_1 to D_2, because:
    - Some consumers who would have otherwise bought new cars bought used cars instead.
    - Some people switched from using public transportation to driving their cars to work.
2. At the same time, the supply of used cars shifted to the left, from S_1 to S_2, because used car dealers were able to buy fewer used cars from rental car companies.
3. The result was that the price of used cars rose from P_1 to P_2 at the same time that the quantity of used cars sold fell from Q_1 to Q_2.



Your Turn: For more practice, do related problems 4.6 and 4.7 at the end of this chapter.

Solved Problem 3.4

Can We Predict Changes in the Price and Quantity of Recycled Plastic?

Many companies that sell reusable water bottles advertise that the bottles are made from recycled plastic. In 2022, an article in the *Wall Street Journal* noted:

> Government policies that set out minimum recycled content levels for plastic packaging are driving more companies into the market for recycled [plastic]. In California, companies will need to use 50% recycled material in bottles by 2030. The European Union has introduced deadlines covering all plastic packaging.

Also in 2022, an article on bloomberg.com noted that some researchers are concerned about the potential health effects of recycled plastic: "The issue with recycling is that melting together different plastics can multiply the additives—and their potential health hazards." The cost of recycling plastic will rise if recyclers have to take steps to reduce the amount of potentially hazardous additives in the recycled plastic they sell.

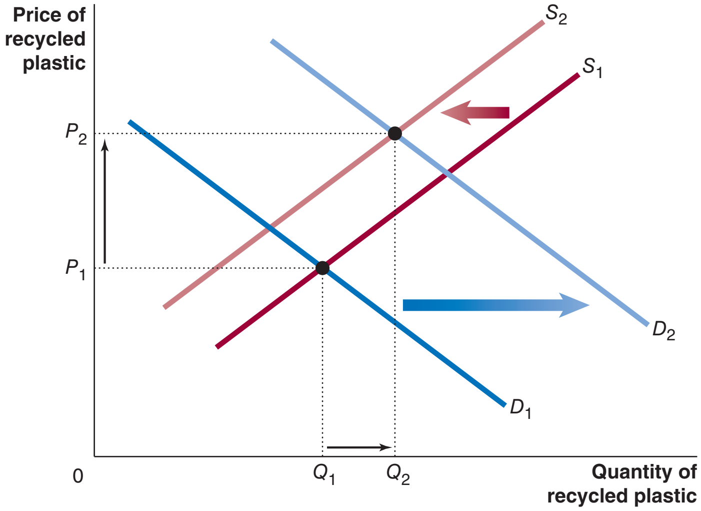
a. Assume that the factors discussed in these two articles have significant effects on the market for recycled plastic. Can we be certain whether the equilibrium price of recycled plastic will increase or decrease? Use a demand and supply graph showing the market for recycled plastic to illustrate your answer.

b. Can we be certain whether the equilibrium quantity of recycled plastic will increase or decrease? Use a demand and supply graph showing the market for recycled plastic to illustrate your answer.

Solving the Problem

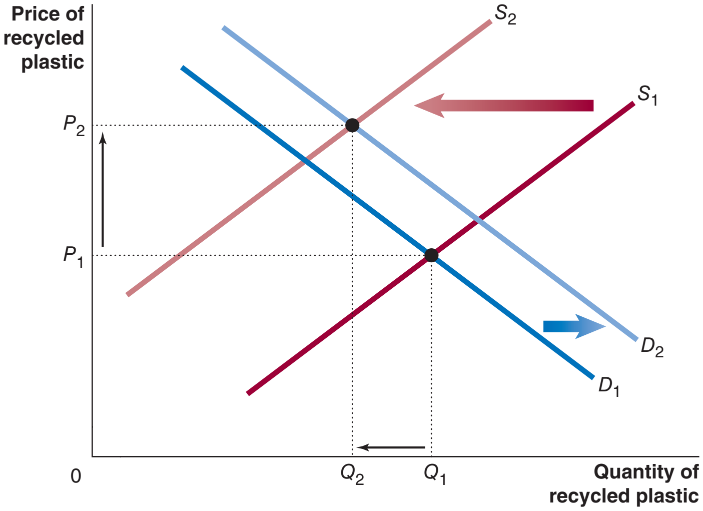
Step 1: **Review the chapter material.** This problem is about how shifts in demand and supply curves affect the equilibrium price, so you might want to review the section "The Effect of Shifts in Demand and Supply over Time."

Step 2: **Answer part (a) using demand and supply analysis.** The problem gives you the information that government regulations are increasing companies' demand for recycled plastic. So, the demand curve for recycled plastic will shift to the right. The problem also gives you the information that the cost of recycling plastic will increase if recyclers need to remove harmful additives. We know that when the cost of producing a good increases, the supply curve will shift to the left. The following graph shows both of these shifts.



As Table 3.3 summarizes, if the demand curve shifts to the right and the supply curve shifts to the left, the equilibrium price must increase. Therefore, we can answer part (a) by stating that we are certain that the equilibrium price of recycled plastic will increase.

Step 3: **Answer part (b) by using demand and supply analysis.** The graph we drew in step 2 shows that the equilibrium quantity of recycled plastic has increased. But given the information provided, the following graph would also be correct. In step 2, we showed the shift in the demand curve as being greater than the shift in the supply curve. In this step, we show the shift in the supply curve as being greater than the shift in the demand curve.



Unlike the graph in step 2, which shows the equilibrium quantity increasing, this graph shows the equilibrium quantity decreasing. The uncertainty about whether the equilibrium quantity has increased or decreased is consistent with what Table 3.3 indicates happens when the demand curve shifts to the right and the supply curve shifts to the left. Therefore, the answer to part (b) is that we cannot be certain whether the equilibrium quantity of recycled plastic will increase or decrease.

Your Turn: For more practice, do related problems 4.8, 4.9, and 4.10 at the end of this chapter.

Don't Let This Happen to You

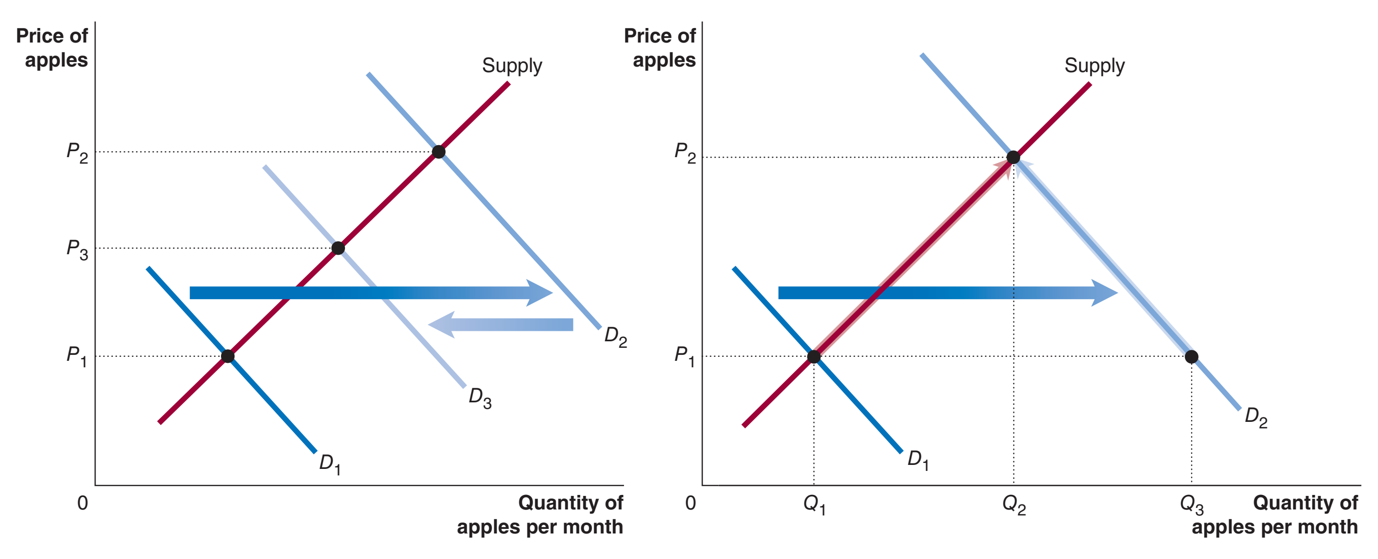
Remember: A Change in a Good's Price Does Not Cause the Demand or Supply Curve to Shift

Suppose a student is asked to draw a demand and supply graph to illustrate how an increase in the price of oranges would affect the market for apples, with other variables being constant. He draws the graph on the left and explains it as follows: "Because apples and oranges are substitutes, an increase in the price of oranges will cause an initial shift to the right in the demand curve for apples, from D_1 to D_2. However, because this initial shift in the demand curve for apples results in a higher price for apples, P_2, consumers will find apples less desirable, and the demand curve will shift to the left, from D_2 to D_3, resulting in a final equilibrium price of P_3." Do you agree or disagree with the student's analysis?

You should disagree. The student has correctly understood that an increase in the price of oranges will cause the demand curve for apples to shift to the right. But the second demand curve shift the student describes, from D_2 to D_3, will not take place. Changes in the price of a product do not result in shifts in the product's demand curve. Changes in the price of a product result only in movements along a demand curve.

The graph on the right shows the correct analysis. The increase in the price of oranges causes the demand curve for apples to increase from D_1 to D_2. At the original price, P_1, the increase in demand initially results in a shortage of apples equal to $Q_3 - Q_1$. But, as we have seen, a shortage causes the price to increase until the shortage is eliminated. In this case, the price will rise to P_2, where both the quantity demanded and the quantity supplied are equal to Q_2. Notice that the increase in price causes a decrease in the *quantity demanded*, from Q_3 to Q_2, but does *not* cause a decrease in demand.

Your Turn: Test your understanding by doing related problems 4.15 and 4.16 at the end of this chapter.



Continued from chapter opener

Economics in Your Life & Career

Can You Forecast the Future Demand for Water Bottles?

At the beginning of this chapter, we asked what variables you would take into account in forecasting future demand if you were a manager for a firm selling water bottles. In Section 3.1, we discussed the factors that affect the demand for a product and provided a list of the most important variables.

In forecasting demand for water bottles, you should take into account factors such as income. Because water bottles are a normal good, increasing incomes over time should lead to increased demand for water bottles. We also saw that water bottles are particularly popular with millennials and members of generation Z, partly because of their environmental concerns. So as these generations account for larger fractions of prime-age consumers, we might expect the demand for water bottles to increase. As we discussed in the chapter opener, the demand for some brands of water bottles has increased because the brands have been promoted by celebrities and influencers. So, you would want to consider the extent to which changing consumer tastes might help or hurt demand by causing people to switch to using substitutes. However, the main substitute for water bottles is bottles of spring water. Because those bottles are made from single-use plastic, people using water bottles because they are reusable may *not* consider bottles of spring water to be close substitutes.

The factors discussed in this chapter provide you with the basic information needed to forecast the demand for water bottles, although arriving at numerical forecasts requires the use of statistical analysis that you can learn in more advanced courses.

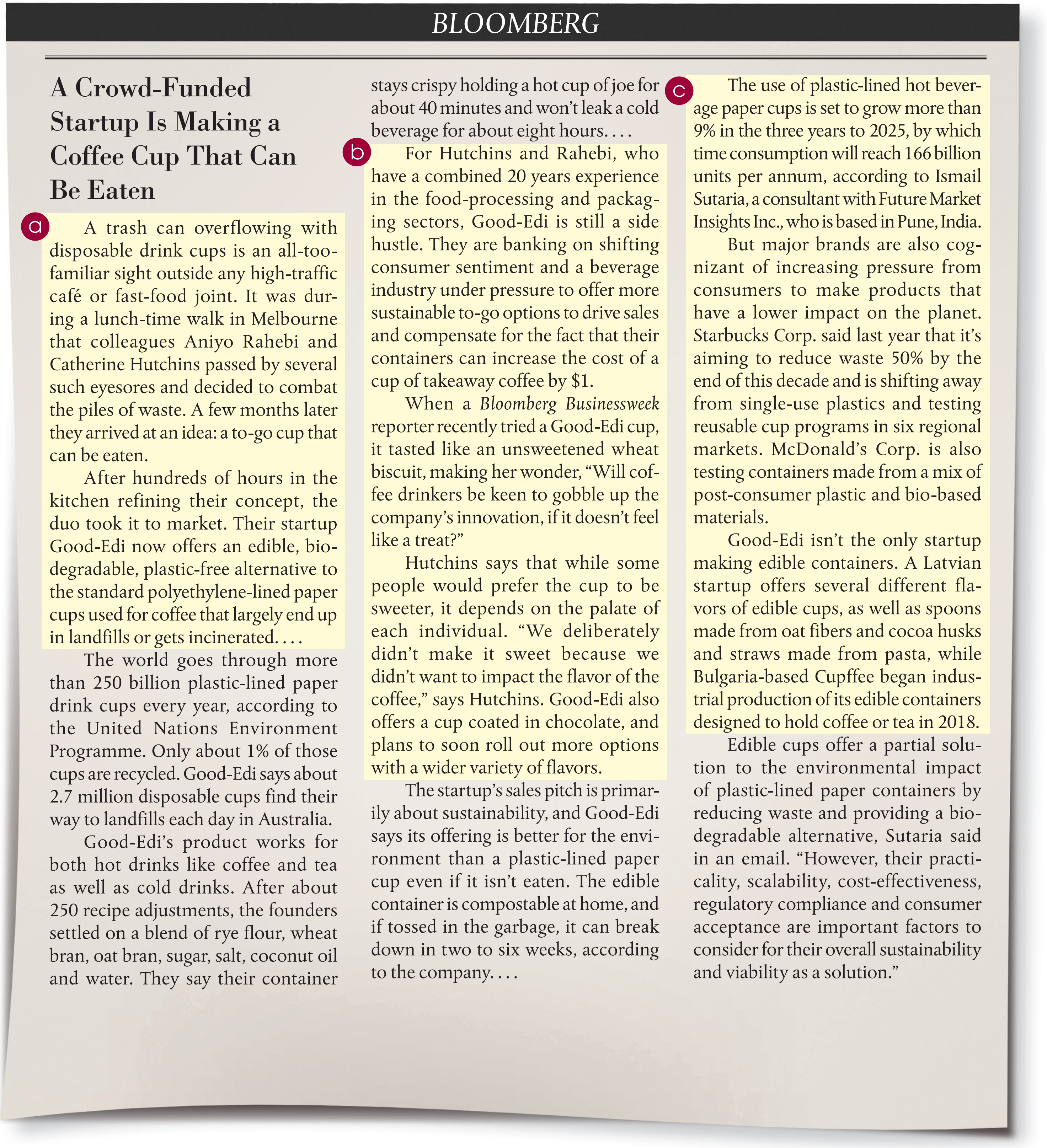
Conclusion

The interaction of demand and supply determines market equilibrium. The model of demand and supply is a powerful tool for predicting how changes in the actions of consumers and firms will cause changes in equilibrium prices and quantities. As we have seen in this chapter, we can use the model to analyze markets that do not meet all the requirements for being perfectly competitive. As long as there is intense competition among sellers, the model of demand and supply can often successfully predict changes in prices and quantities. We will use this model in the next chapter to analyze economic efficiency and the results of government-imposed price floors and price ceilings.

Before moving on to Chapter 4, read *An Inside Look* on the next page for a discussion of how some startups, as well as established companies like Starbucks and McDonald's, are testing edible cups and reusable containers.

AN **INSIDE** LOOK

Why Throw Away Your Coffee Cup When You Can Eat It?



BLOOMBERG

A Crowd-Funded Startup Is Making a Coffee Cup That Can Be Eaten

ⓐ A trash can overflowing with disposable drink cups is an all-too-familiar sight outside any high-traffic café or fast-food joint. It was during a lunch-time walk in Melbourne that colleagues Aniyo Rahebi and Catherine Hutchins passed by several such eyesores and decided to combat the piles of waste. A few months later they arrived at an idea: a to-go cup that can be eaten.

After hundreds of hours in the kitchen refining their concept, the duo took it to market. Their startup Good-Edi now offers an edible, biodegradable, plastic-free alternative to the standard polyethylene-lined paper cups used for coffee that largely end up in landfills or gets incinerated. . . .

The world goes through more than 250 billion plastic-lined paper drink cups every year, according to the United Nations Environment Programme. Only about 1% of those cups are recycled. Good-Edi says about 2.7 million disposable cups find their way to landfills each day in Australia.

Good-Edi's product works for both hot drinks like coffee and tea as well as cold drinks. After about 250 recipe adjustments, the founders settled on a blend of rye flour, wheat bran, oat bran, sugar, salt, coconut oil and water. They say their container stays crispy holding a hot cup of joe for about 40 minutes and won't leak a cold beverage for about eight hours. . . .

ⓑ For Hutchins and Rahebi, who have a combined 20 years experience in the food-processing and packaging sectors, Good-Edi is still a side hustle. They are banking on shifting consumer sentiment and a beverage industry under pressure to offer more sustainable to-go options to drive sales and compensate for the fact that their containers can increase the cost of a cup of takeaway coffee by $1.

When a *Bloomberg Businessweek* reporter recently tried a Good-Edi cup, it tasted like an unsweetened wheat biscuit, making her wonder, "Will coffee drinkers be keen to gobble up the company's innovation, if it doesn't feel like a treat?"

Hutchins says that while some people would prefer the cup to be sweeter, it depends on the palate of each individual. "We deliberately didn't make it sweet because we didn't want to impact the flavor of the coffee," says Hutchins. Good-Edi also offers a cup coated in chocolate, and plans to soon roll out more options with a wider variety of flavors.

The startup's sales pitch is primarily about sustainability, and Good-Edi says its offering is better for the environment than a plastic-lined paper cup even if it isn't eaten. The edible container is compostable at home, and if tossed in the garbage, it can break down in two to six weeks, according to the company. . . .

ⓒ The use of plastic-lined hot beverage paper cups is set to grow more than 9% in the three years to 2025, by which time consumption will reach 166 billion units per annum, according to Ismail Sutaria, a consultant with Future Market Insights Inc., who is based in Pune, India.

But major brands are also cognizant of increasing pressure from consumers to make products that have a lower impact on the planet. Starbucks Corp. said last year that it's aiming to reduce waste 50% by the end of this decade and is shifting away from single-use plastics and testing reusable cup programs in six regional markets. McDonald's Corp. is also testing containers made from a mix of post-consumer plastic and bio-based materials.

Good-Edi isn't the only startup making edible containers. A Latvian startup offers several different flavors of edible cups, as well as spoons made from oat fibers and cocoa husks and straws made from pasta, while Bulgaria-based Cupffee began industrial production of its edible containers designed to hold coffee or tea in 2018.

Edible cups offer a partial solution to the environmental impact of plastic-lined paper containers by reducing waste and providing a biodegradable alternative, Sutaria said in an email. "However, their practicality, scalability, cost-effectiveness, regulatory compliance and consumer acceptance are important factors to consider for their overall sustainability and viability as a solution."

Key Points in the Article

Concerns about the effect that disposable beverage cups are having on the environment inspired an Australian startup company called Good-Edi to produce edible coffee cups. The flour-based cups are currently being produced in plain and chocolate-coated varieties, and the company is planning to expand its flavor options. According to the United Nations Environment Program, more than 250 billion plastic-lined paper beverage cups are used globally each year, and only about 1% of them are recycled. Companies are aware of consumer pressure to produce more environmentally friendly products. The founders of Good-Edi hope their edible and biodegradable cup will meet the environmental concerns of both consumers and the beverage industry.

Analyzing the News

ⓐ A pair of Australian entrepreneurs have started a company that produces edible beverage cups. They started their company because they were concerned about the number of disposable drink cups they saw in trash cans outside cafes and restaurants. Their company, Good-Edi, supplies edible cups as an environmentally friendly alternative to the traditional plastic-lined paper cups commonly used for hot and cold beverages.

ⓑ While Good-Edi's cups cost more than traditional disposable cups, the company believes that the beverage industry and its customers are seeking more sustainable options that will reduce the amount of trash that ends up in landfills. If the company is correct that consumers' willingness to purchase edible cups has increased, then the demand for these cups has increased. Figure 1 illustrates an increase in consumers' taste for edible coffee cups. The demand curve shifts to the right, from D_1 to D_2, resulting in an increase in both the equilibrium price (from P_1 to P_2) and the equilibrium quantity (from Q_1 to Q_2). The higher equilibrium price also results in an increase in quantity supplied, illustrated by the movement from the original equilibrium point *A* to the new equilibrium point *B*.

ⓒ Some major corporations have already begun using more environmentally friendly packaging. Starbucks is testing reusable cups in some markets, and McDonald's is experimenting with containers made from post-consumer plastics and bio-based materials. Good-Edi and a few other startup companies are currently producing edible containers, including one in Latvia and another in Bulgaria. If edible coffee cups become a viable alternative and gain acceptance in the marketplace, even more firms will likely enter the market. Figure 2 illustrates an increase in the number of sellers of edible coffee cups. This increase shifts the supply curve to the right, from S_1 to S_2, resulting in a decrease in the equilibrium price (from P_1 to P_2) and an increase in the equilibrium quantity (from Q_1 to Q_2). The lower equilibrium price results in an increase in quantity demanded, illustrated by the movement from equilibrium point *A* to equilibrium point *B*.

Thinking Critically

1. Suppose that the price of traditional plastic-lined disposable coffee cups increases. Use a demand and supply graph to show the effect of this price increase on the market for edible cups. Be sure to properly label all curves in your graph, show any shifts in those curves, and show the initial and new equilibrium price and quantity.
2. Suppose that one of the inputs companies use to make edible coffee cups increases in price. Use a demand and supply graph to show the effect of the increase in the price of an input on the market for edible cups. Be sure to properly label all curves in your graph, show any shifts in those curves, and show the initial and new equilibrium price and quantity.

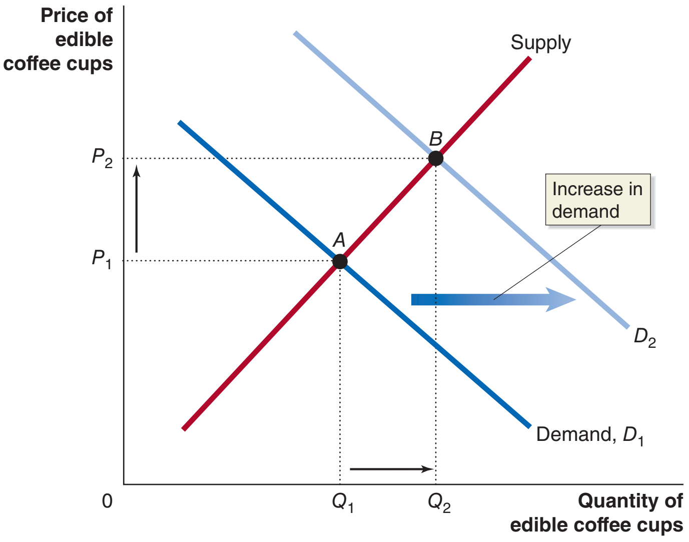


Figure 1: An increase in consumers' taste for edible coffee cups shifts the demand curve to the right. Holding constant all other factors affecting demand, both equilibrium price and equilibrium quantity increase.

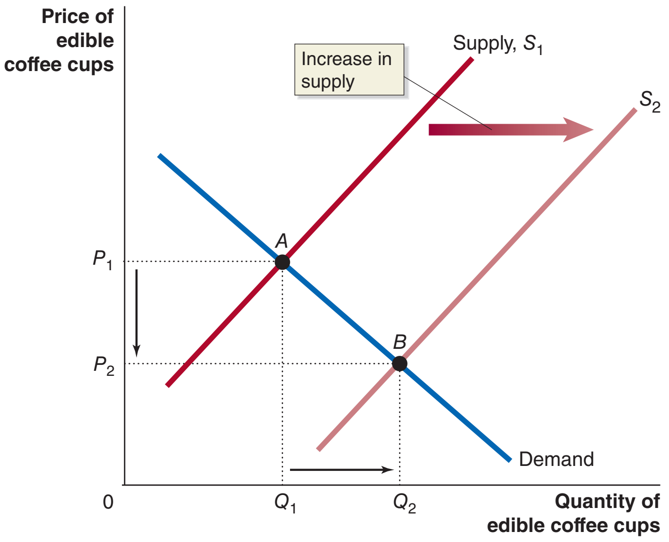


Figure 2: An increase in the number of firms in the market shifts the supply curve for edible coffee cups to the right. Holding constant all other factors affecting supply, equilibrium price decreases, and equilibrium quantity increases.

CHAPTER SUMMARY AND PROBLEMS

Key Terms

Ceteris paribus ("all else equal") condition, p. 78
Competitive market equilibrium, p. 90
Complements, p. 79
Demand curve, p. 76
Demand schedule, p. 76
Demographics, p. 80
Income effect, p. 77
Inferior good, p. 79
Law of demand, p. 77
Law of supply, p. 85
Market demand, p. 76
Market equilibrium, p. 90
Natural disaster, p. 82
Normal good, p. 78
Pandemic, p. 82
Perfectly competitive market, p. 76
Quantity demanded, p. 76
Quantity supplied, p. 84
Shortage, p. 90
Substitutes, p. 79
Substitution effect, p. 77
Supply curve, p. 84
Supply schedule, p. 84
Surplus, p. 90
Technological change, p. 85

3.1 The Demand Side of the Market

LEARNING OBJECTIVE: List and describe the variables that influence demand.

Summary

The model of demand and supply is the most powerful tool in economics. The model applies exactly only to **perfectly competitive markets**, where there are many buyers and sellers, all the products sold are identical, and there are no barriers to new sellers entering the market. But the model can also be useful in analyzing markets that don't meet all these requirements.

The **quantity demanded** is the amount of a good or service that a consumer is willing and able to purchase at a given price. A **demand schedule** is a table that shows the relationship between the price of a product and the quantity of the product demanded. A **demand curve** is a curve that shows the relationship between the price of a product and the quantity of the product demanded. **Market demand** is the demand by all consumers of a given good or service. The **law of demand** states that ***ceteris paribus***—holding everything else constant—the quantity of a product demanded increases when the price falls and decreases when the price rises. Demand curves slope downward because of the **substitution effect**, which is the change in quantity demanded of a good that results from a change in price making the good more or less expensive relative to other goods, and the **income effect**, which is the change in quantity demanded of a good that results from the effect of a change in price on consumer purchasing power, holding all other factors constant. Changes in income, the prices of related goods, tastes, population and demographics, expected future prices, and natural disasters and pandemics all cause the demand curve to shift. **Substitutes** are goods that can be used for the same purpose. **Complements** are goods that are used together. A **normal good** is a good for which demand increases as income increases. An **inferior good** is a good for which demand decreases as income increases. **Demographics** refers to the characteristics of a population with respect to age, race, and gender. A change in demand refers to a shift of the demand curve. A change in quantity demanded refers to a movement along the demand curve as a result of a change in a product's price. **Natural disaster** (in an economic context) refers to a hurricane, flood, or similar act of nature that causes damage to stores, factories, or office buildings. A **pandemic** (in an economic context) is a situation in which a disease becomes sufficiently widespread as to significantly affect economic activity.

Review Questions

1.1 What is a demand schedule? What is a demand curve?
1.2 What do economists mean when they use the Latin expression *ceteris paribus?*
1.3 What is the difference between a change in demand and a change in quantity demanded?
1.4 What is the law of demand? Use the substitution effect and the income effect to explain why an increase in the price of a product causes a decrease in the quantity demanded.
1.5 What are the main variables that cause the demand curve to shift? Give an example of each.

Problems and Applications

1.6 The late Nobel Laureate Gary Becker once described how an economist should analyze the demand for butter: "[An economist] would want to consider the price of butter and probably the level of income, the price of margarine, and the size of the population as well. But [the economist] would neglect thousands and thousands of other variables."
  a. What approach to analyzing demand curves was Becker describing?
  b. As an economist, how can you hope that your analysis of the demand for butter is accurate if you neglect thousands and thousands of other variables?

1.7 For each of the following pairs of products, briefly explain which pairs are complements, which are substitutes, and which are unrelated.
  a. New cars and used cars
  b. Houses and washing machines
  c. Yeti water bottles and Hydro Flask water bottles
  d. Yeti water bottles and textbooks

1.8 It's possible to buy many books either as print, or physical, books or as digital books.

- **a.** If the price of digital books rises, what would you expect to happen to the demand for print books? Briefly explain.
- **b.** The goal of the Google Books project is to produce a digital version of every book ever written. An academic paper by Abhishek Nagaraj of the University of California, Berkeley and Imke Reimers of Northeastern University analyzed the effect of Google Books on the market for print, or physical, books. They concluded that for their sample of books, "digitization . . . increased sales of physical editions by about 35%, especially for less popular works." Does this paper indicate that digital books and print books are substitutes or complements? Briefly discuss what might account for this result and why it differs from the answer you gave to part (a). (*Hint:* Why was the finding of increased sales of physical books particularly strong for less popular books?)

1.9 An article on bloomberg.com observes that "persistently high prices for a certain good lead to less demand for that good." Is the author correct that if the price of a product increases, the demand for the product is reduced? Briefly explain.

1.10 In 2022, an article in the *Wall Street Journal* on the recreational vehicle (RV) industry noted that some forecasters believed that the quantity of RVs sold was about to decline. Consider the following factors affecting the RV market:

- **a.** Increased concern among some households that a recession might occur, which would reduce their future incomes
- **b.** An increase in interest rates on loans from banks to finance the purchase of RVs
- **c.** Higher gasoline prices
- **d.** Reduced concern about the Covid–19 pandemic leading to an increased willingness to travel by air

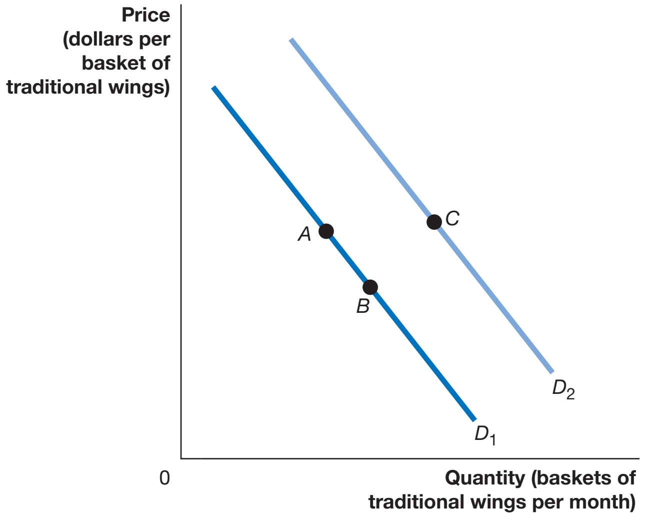
Briefly explain whether each of these factors would cause a movement along the demand curve for RVs or a shift in the demand curve for RVs. If you believe the demand curve would shift, briefly explain why it would shift and whether the curve would shift to the right or to the left.

1.11 Suppose that the following table shows the quantity demanded of UGG boots at five different prices in 2023 and 2024.

	Quantity Demanded (thousands of pairs of boots)	
Price	**2023**	**2024**
$160	5,000	4,000
170	4,500	3,500
180	4,000	3,000
190	3,500	2,500
200	3,000	2,000

Name two different variables that, if their values were to change, would cause the quantity demanded of UGG boots to change from 2023 to 2024, as indicated in the table.

1.12 Suppose that the curves in the following graph represent two demand curves for traditional chicken wings (basket of six) at Buffalo Wild Wings. What would cause a movement from point *A* to point *B* on D_1? Name two variables that, if their values were to change, would cause a movement from point *A* to point *C*.



1.13 **[Related to the Apply the Concept "When Did Most People Stop Wearing Hats?"]** In recent years, fewer households have been relying on traditional cable television or on broadcast television for entertainment. In 2022, for the first time, people in the United States spent more time watching streaming services than watching either traditional cable or broadcast television. Traditional cable television is sometimes called "pay-TV." An article in the *Wall Street Journal* included the opinion of an investment analyst that "streaming services offer more convenience to users because they can watch shows and movies whenever they want, while traditional pay-TV is losing its appeal beyond live events such as sports."

- **a.** Is the decline in the number of people watching cable television likely the result of a movement along the demand curve for cable television or a shift in the demand curve? What information would you need to be confident in your answer?
- **b.** In what ways are the causes of the decline in the number of people watching cable television similar to the causes of the decline in the number of people wearing hats? In what ways are they different?

1.14 **[Related to the Apply the Concept "Millennials and Generation Z Shake Up the Markets for Groceries, Big Macs, and Water Bottles"]** From 1979 to 2015, China had a policy that allowed couples to have only one child each. The one-child policy caused a change in the demographics of China. Between 1980 and 2021, the share of the population aged 14 and under decreased from 36 percent to 18 percent. And, as parents attempted to ensure that the lone child was a son, the number of male children relative to female children increased. Choose three goods and discuss how the demand for them has been affected by China's one-child policy.

1.15 **[Related to the Apply the Concept "Millennials and Generation Z Shake Up the Markets for Groceries, Big Macs, and Water Bottles"]** An article in the *Wall Street Journal* on the market for traditional canned tuna stated the following two facts:

- **i.** Firms selling traditional canned tuna are struggling to connect with millennial and generation Z consumers, "who favor fresher, less-processed options" in the food they eat.
- **ii.** Firms selling traditional canned tuna are facing competition from firms that offer tuna for sale in "pouches and kits with trendy flavors or as a healthy snack."
  - **a.** From this information, can we conclude that falling sales of traditional cans of tuna is likely the result of a movement along the demand curve for traditional cans of tuna or a shift in the demand curve? Briefly explain.
  - **b.** Which would be better news for firms selling traditional canned tuna: Fact (i) is more important in explaining their declining sales than fact (ii) or the reverse? Briefly explain.

1.16 According to an article in the *Wall Street Journal* in 2022, although McDonald's had been raising prices, "sales of all types of meals, particularly breakfast, were higher."

- **a.** Can we conclude from this information that the demand curve for McDonald's meals is upward sloping? Briefly explain.
- **b.** During 2022, the prices at fast-food restaurants like McDonald's were increasing, but they were doing so more slowly than the prices at other restaurants. The article noted that McDonald's was "gaining some consumers who are shifting away from sit-down and fast-casual restaurants." Does this additional information help you answer the question in part (a)? Briefly explain.

1.17 **[Related to the Economics in Your Life & Career]** According to a survey by the investment bank Roth Capital Partners, 74 percent of millennials own reusable water bottles. An article on water bottles in the *Huffington Post* noted: "Celebs love them. Social influencers love them. Regular people love them." Leaving aside other factors affecting the demand for water bottles, does this information lead you to think that demand for water bottles is likely to increase rapidly or increase slowly? Briefly explain.

3.2 The Supply Side of the Market

LEARNING OBJECTIVE: List and describe the variables that influence supply.

Summary

The **quantity supplied** is the amount of a good that a firm is willing and able to supply at a given price. A **supply schedule** is a table that shows the relationship between the price of a product and the quantity of the product supplied. A **supply curve** is a curve that shows the relationship between the price of a product and the quantity of the product supplied. When the price of a product rises, producing the product is more profitable, and a greater amount will be supplied. The **law of supply** states that, holding everything else constant, the quantity of a product supplied increases when the price rises and decreases when the price falls. Changes in the prices of inputs, technology, the prices of related goods in production, the number of firms in a market, expected future prices, and natural disasters and pandemics all cause the supply curve to shift. **Technological change** is a positive or negative change in the ability of a firm to produce a given level of output with a given quantity of inputs. A change in supply refers to a shift of the supply curve. A change in quantity supplied refers to a movement along the supply curve as a result of a change in the product's price.

Review Questions

2.1 What is a supply schedule? What is a supply curve?
2.2 What is the difference between a change in supply and a change in quantity supplied?
2.3 What is the law of supply? What are the main variables that cause a supply curve to shift? Give an example of each.

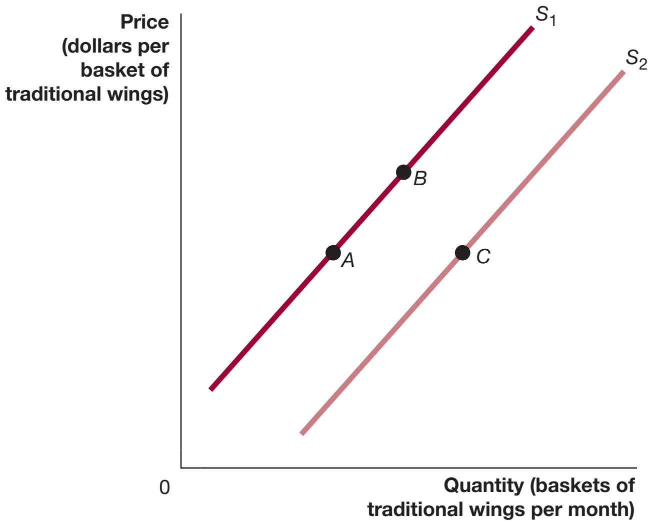
Problems and Applications

2.4 Briefly explain whether each of the following statements describes a change in supply or a change in quantity supplied.

- **a.** To take advantage of high prices for snow shovels during a snowy winter, Alexander Shovels, Inc., decides to increase output.
- **b.** The success of Yeti and Hydro Flask water bottles leads more firms to begin producing water bottles.
- **c.** When the Covid–19 pandemic arrived in the United States, production of automobiles declined from 218,800 in February 2020 to 1,700 in April 2020.

2.5 **[Related to the Apply the Concept "Fracking, the U.S. Oil Boom, and Expected Oil Prices"]** From June to September 2022, oil prices in the United States declined by about 35 percent. During these same months, U.S. oil production remained roughly constant, and stocks of oil in storage increased. An article in the *Wall Street Journal* published at the end of September 2022 noted that despite the decline in oil prices, there was "widespread agreement on Wall Street that the fundamentals should mean a rebound," and "Wall Street forecasts prices will rise." (Note that when financial writers refer to opinions on "Wall Street," they are discussing the views of investors in the markets for financial assets like stocks and for *commodities* like oil.) When oil prices are falling, why might oil firms continue to produce oil? Does your answer depend on what oil firms expect to happen to oil prices in the future? Briefly explain, making sure to include in your answer a discussion of any movement along or a shift in the supply curve for oil.

2.6 Suppose that the curves in the following graph represent two supply curves for traditional chicken wings (basket of six) at Buffalo Wild Wings. What would cause a movement from point *A* to point *B* on S_1? Name two variables that, if their values were to change, would cause a movement from point *A* to point *C*.



2.7 Suppose that the following table shows the quantity supplied of UGG boots at five different prices in 2023 and 2024.

	Quantity Supplied (thousands of pairs of boots)	
Price	**2023**	**2024**
$160	3,000	2,000
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180	4,000	3,000
190	4,500	3,500
200	5,000	4,500

Name two different variables that, if their values were to change, would cause the quantity supplied of UGG boots to change from 2023 to 2024 as indicated in the table.

2.8 In 2018, an unusual situation developed with respect to production of natural gas in the Permian Basin of western Texas and New Mexico. A news article noted the following two facts:

- **i.** "Shale drillers in the Permian Basin are producing vast amounts of [natural] gas as a byproduct of prospecting for oil."
- **ii.** Natural "gas prices in parts of the prolific region hovered near zero last month and some trades went negative, to as low as a negative 25 cents per million British thermal units."

a. What does it mean for a price to be negative?

b. Why would firms drilling in the Permian Basin continue producing natural gas if they receive a zero or negative price for it?

2.9 According to a news article:

> About 1.4 billion pounds of American, cheddar and other kinds of cheese is socked away at cold-storage warehouses across the country, the biggest stockpile since federal record-keeping began a century ago. . . . Many [cheese companies] are paying to store their excess cheese in hopes demand and prices will improve.

What effect did the strategy of warehousing cheese have on the supply of cheese? Use a graph to illustrate your answer.

3.3 Market Equilibrium: Putting Demand and Supply Together

LEARNING OBJECTIVE: Use a graph to illustrate market equilibrium.

Summary

Market equilibrium occurs where the demand curve intersects the supply curve. A **competitive market equilibrium** is a market equilibrium with many buyers and sellers. Only at this point is the quantity demanded equal to the quantity supplied. Prices above equilibrium result in **surpluses**, with the quantity supplied being greater than the quantity demanded. Surpluses cause the market price to fall. Prices below equilibrium result in **shortages**, with the quantity demanded being greater than the quantity supplied. Shortages cause the market price to rise.

Review Questions

3.1 What do economists mean by *market equilibrium*?

3.2 What do economists mean by *shortage*? By *surplus*?

3.3 What happens in a market if the current price is above the equilibrium price? What happens if the current price is below the equilibrium price?

Problems and Applications

3.4 Briefly explain whether you agree with the following statement: "When there is a shortage of a good, consumers eventually give up trying to buy it, so the demand for the good declines, and the price falls until the market is finally in equilibrium."

3.5 The *Wall Street Journal* reported in February 2023 that "several major apparel and accessory brands . . . reported weaker sales. . . . The industry is still struggling to address last year's retail inventory glut. . . . Companies have been discounting everything from Levi's skinny jeans to Vans sneakers."

a. When there is a glut, or surplus, in a market, does this mean that the supply of a product is greater than the demand or that the quantity supplied is greater than the quantity demanded?

b. What does the article mean by "discounting"? Explain how discounting would eliminate a surplus of Levi's skinny jeans.

   c. If there is a surplus in the market for a product, does this mean the product is not scarce? Briefly explain.

3.6 An article in the *Wall Street Journal* in 2022 indicated that consumer demand for some products sold in department stores, such as plates and dishes, had declined. The article quoted the CEO of Macy's department store as saying: "It's classic supply and demand. Too much supply, not enough demand." Draw a demand and supply graph for the market for plates and dishes to illustrate this situation. Show on your graph what is likely to happen to the equilibrium price of plates and dishes.

3.7 **[Related to Solved Problem 3.3]** In *The Wealth of Nations*, Adam Smith discussed what has come to be known as the "diamond and water paradox":

> Nothing is more useful than water: but it will purchase scarce anything; scarce anything can be had in exchange for it. A diamond, on the contrary, has scarce any value in use; but a very great quantity of other goods may frequently be had in exchange for it.

Graph the market for diamonds and the market for water. Show how it is possible for the price of water to be much lower than the price of diamonds, even though the demand for water is much greater than the demand for diamonds.

3.8 **[Related to Solved Problem 3.3]** An article describes the market for autographs by Mickey Mantle, the superstar center fielder for the New York Yankees during the 1950s and 1960s: "At card shows, golf outings, charity dinners, Mr. Mantle signed his name over and over." One expert on sports autographs was quoted as saying, "He was a real good signer. . . . He is not rare." Yet the article quoted another expert as saying, "Mr. Mantle's autograph ranks No. 3 of most-popular autographs, behind Babe Ruth and Muhammad Ali." A baseball signed by Mantle is likely to sell for the relatively high price of $250 to $400. By contrast, baseballs signed by Whitey Ford, a teammate of Mantle's on the Yankees, typically sell for less than $150. Use one graph to show both the demand and supply for autographs by Whitey Ford and the demand and supply for autographs by Mickey Mantle. Show how it is possible for the price of Mantle's autographs to be higher than the price of Ford's autographs, even though the supply of Mantle autographs is larger than the supply of Ford autographs.

3.9 **[Related to Solved Problem 3.3]** Sawmills use logs purchased from tree farmers to manufacture lumber used to build houses. An article in the *Wall Street Journal* discussed why tree farmers weren't benefiting from high lumber prices: "Timber growers across the U.S. South, where much of the nation's logs are harvested, have gained nothing from the run-up in prices for finished lumber. It is the region's sawmills . . . that are harvesting the profits." Use a demand and supply graph of the market for logs to explain how it is possible that despite strong demand for lumber to be used in housing, tree farmers were only receiving low prices for the logs they sold to sawmills.

3.10 If a market is in equilibrium, is it necessarily true that all buyers and sellers are satisfied with the market price? Briefly explain.

3.11 A news story in 2022 about the rental market for office space in New York City noted that the borough of "Manhattan still has a glut of office space." The article also reported that "overall, the average asking rent in Manhattan fell . . . to $75.43 per square foot. That's still below the prepandemic average of $79.47 in March 2020."

   a. What does the article mean by a "glut"? What does a glut imply about the quantity of offices demanded relative to the quantity supplied?

   b. Is the fact that office rents in Manhattan were falling connected to the fact that there was a glut in the market? Briefly explain.

   c. Briefly explain whether the glut in this market is likely to eventually disappear.

3.4 The Effect of Demand and Supply Shifts on Equilibrium

LEARNING OBJECTIVE: Use demand and supply graphs to predict changes in prices and quantities.

Summary

In most markets, demand and supply curves shift frequently, causing changes in equilibrium prices and quantities. Over time, if demand increases more than supply, the equilibrium price will rise. If supply increases more than demand, the equilibrium price will fall.

Review Questions

4.1 Draw a demand and supply graph to show the effect on the equilibrium price in a market in the following situations:

   a. The demand curve shifts to the right.

   b. The supply curve shifts to the left.

4.2 If, over time, the demand curve for a product shifts to the right more than the supply curve does, what will happen to the equilibrium price? What will happen to the equilibrium price if the supply curve shifts to the right more than the demand curve? For each case, draw a demand and supply graph to illustrate your answer.

Problems and Applications

4.3 An article in the *Wall Street Journal* reported that Tesla Inc. delivered about 35 percent more electric vehicles (EVs) in the first quarter of 2023 than in the same quarter of 2022. Elon Musk, Tesla's chief executive, stated that "orders picked up after Tesla cut prices." Did the increase in the supply of Tesla EVs result in an increase in demand or an increase in the quantity demanded of Tesla EVs? Briefly explain.

4.4 **[Related to the Chapter Opener]** Suppose the demand for water bottles increases rapidly during 2024. At the same time, six more firms begin producing water bottles. A student remarks that, because of these events, we can't know for certain whether the price of water bottles will rise or fall. Briefly explain whether you agree. Be sure to include a demand and supply graph of the market for water bottles to illustrate your answer.

4.5 The headline on a personal technology column in the *Wall Street Journal* in late 2022 was "These Next Generation Headphones Don't Even Go in Your Ears." According to the column, unlike the earbuds that many people use with their smartphones, "bone-conduction headphones are built differently. . . . They rest above your ears, leaving your ear canal unencumbered, and vibrate against the part of your skull adjacent to your inner ear."

- **a.** Are bone-conduction headphones substitutes for or complements to smartphones? Briefly explain.
- **b.** Suppose that the price of smartphones increases. Use a demand and supply graph of the market for bone-conduction headphones to show the effect on the equilibrium price and quantity. Be sure that your graph shows the equilibrium price and quantity before and after the increase in the price of smartphones.

4.6 **[Related to the Apply the Concept "Sticker Shock in the Market for Used Cars"]** From March 2022 to October 2022, the price of aluminum declined by 36 percent. During that same period, the demand for water bottles made using aluminum increased.

- **a.** Draw a demand and supply graph illustrating the effect of these factors on the market for aluminum water bottles. Be sure to indicate (1) the equilibrium price and quantity before and the equilibrium price and quantity after the decrease in the price of aluminum, and (2) the increase in demand for aluminum water bottles.
- **b.** Can you be sure whether the equilibrium price of aluminum water bottles increased or decreased as a result of these factors? Briefly explain.
- **c.** Can you be sure whether the equilibrium quantity of aluminum water bottles increased or decreased as a result of these factors? Briefly explain.

4.7 **[Related to the Apply the Concept "Sticker Shock in the Market for Used Cars"]** According to a news article, "the health benefits of coconut oil have been challenged by the American Heart Association and other organizations in recent years and that has hurt demand." The article also noted that more plantations growing coconuts had "sprung up in the [Philippines] and elsewhere." Use a demand and supply graph to illustrate your answers to the following questions.

- **a.** Can we use this information to be certain whether the equilibrium price of coconut oil increased or decreased?
- **b.** Can we use this information to be certain whether the equilibrium quantity of coconut oil increased or decreased?

4.8 **[Related to Solved Problem 3.4]** The demand for watermelons is highest during summer and lowest during winter. Yet watermelon prices are normally lower in summer than in winter. Use a demand and supply graph to demonstrate how this is possible. Be sure to carefully label the curves in your graph and to clearly indicate the equilibrium summer price and the equilibrium winter price.

4.9 **[Related to Solved Problem 3.4]** According to one observer of the lobster market: "After Labor Day, when the vacationers have gone home, the lobstermen usually have a month or more of good fishing conditions, except for the occasional hurricane." Use a demand and supply graph to explain whether lobster prices are likely to be higher or lower during the fall than during the summer.

4.10 **[Related to Solved Problem 3.4]** In October 2022, an article in the *Wall Street Journal* discussing the housing market observed that "U.S. existing home sales fell for an eighth straight month in September. . . . Despite the sharp decline in sales, home prices are rising."

- **a.** From this information, can we tell whether the demand curve for housing, the supply curve for housing, or both curves shifted?
- **b.** If we assume that both curves shifted, can we tell whether each shifted to the right or to the left? Use a demand and supply graph to illustrate your answer.

4.11 Years ago, an apple producer argued that the United States should enact a tariff, or a tax, on imports of bananas. His reasoning was that "the enormous imports of cheap bananas into the United States tend to curtail the domestic consumption of fresh fruits produced in the United States."

- **a.** Was the apple producer assuming that apples and bananas are substitutes or complements? Briefly explain.
- **b.** If a tariff on bananas acts as an increase in the cost of supplying bananas in the United States, use two demand and supply graphs to show the effects of the apple producer's proposal. One graph should show the effect on the banana market in the United States, and the other graph should show the effect on the apple market in the United States. Be sure to label the change in equilibrium price and quantity in each market and any shifts in the demand and supply curves.

4.12 According to an article in the *Wall Street Journal*, both the quantity of organic milk sold and the price per half gallon have been falling. For each of the following scenarios, briefly explain whether the scenario can account for this outcome.

- **a.** The demand for organic milk has been decreasing, while the supply of organic milk has been increasing.
- **b.** The demand for organic milk has been increasing, while the supply of organic milk has been decreasing.
- **c.** The demand for organic milk and the supply of organic milk have both been increasing.
- **d.** The demand for organic milk and the supply of organic milk have both been decreasing.

4.13 According to the U.S. Bureau of Transportation Statistics, between 1998 and 2022, the number of nonstop coast-to-coast flights in the United States more than doubled at the same time that the average price of a ticket declined. For each of the following scenarios, briefly explain whether the scenario can account for this outcome.

- **a.** The demand for coast-to-coast flights decreased during this period, while the supply of flights increased.
- **b.** The demand for coast-to-coast flights increased during this period, while the supply of flights decreased.

c. The demand for coast-to-coast flights and the supply of flights both increased during this period.

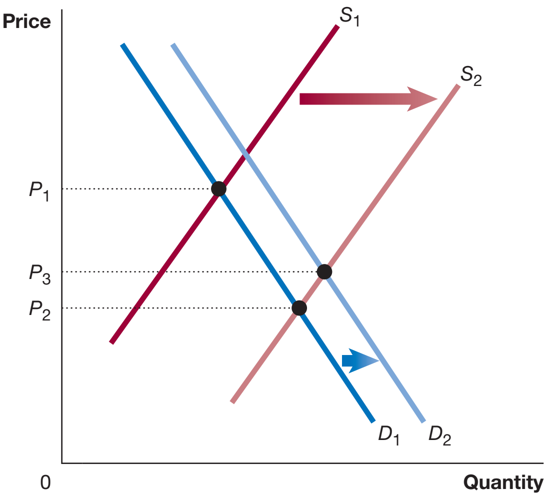
d. The demand for coast-to-coast flights and the supply of flights both decreased during this period.

4.14 If the equilibrium price and quantity of a product were \$100 and 1,000 units per month in 2023 and \$150 and 800 units per month in 2024, did this product experience a larger shift in its demand curve or in its supply curve from 2023 to 2024? Briefly explain.

4.15 **[Related to the Don't Let This Happen to You]** A student wrote the following: "Increased production leads to a lower price, which in turn increases demand." Do you agree with his reasoning? Briefly explain.

4.16 **[Related to the Don't Let This Happen to You]** A student was asked to draw a demand and supply graph to illustrate the effect on the market for water bottles of a fall in the price of the recycled plastic used in some brands of water bottles, holding everything else constant. She drew the following graph and explained it as follows:

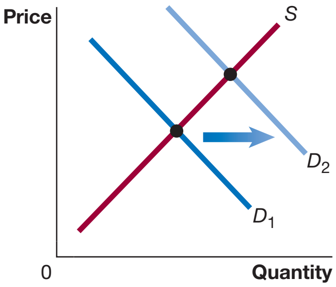
> Recycled plastic is an input to some brands of water bottles, so a fall in the price of recycled plastic will cause the supply curve for water bottles to shift to the right (from S_1 to S_2). Because this shift in the supply curve results in a lower price (P_2), consumers will want to buy more water bottles, and the demand curve will shift to the right (from D_1 to D_2). We know that more water bottles will be sold, but we can't be sure whether the price of water bottles will rise or fall. That depends on whether the supply curve or the demand curve has shifted farther to the right. I assume that the effect on supply is greater than the effect on demand, so I show the final equilibrium price (P_3) as being lower than the initial equilibrium price (P_1).



Explain whether you agree with the student's analysis. Be careful to explain exactly what—if anything—you find wrong with her analysis.

4.17 The following four graphs represent four market scenarios, each of which would cause either a movement along the supply curve for premium bottled water or a shift of the supply curve. Match each scenario with the appropriate graph.

1.



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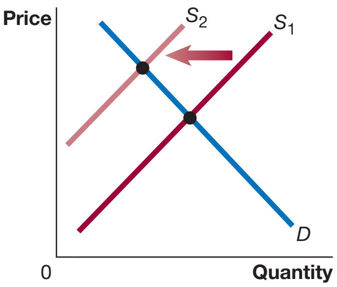

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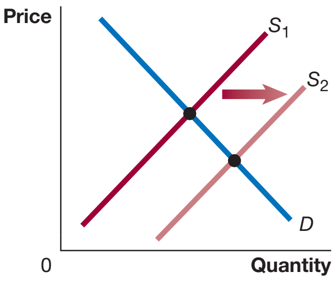

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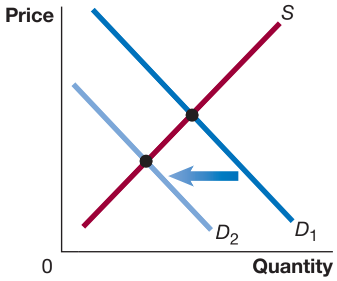


a. A decrease in the supply of sports drinks

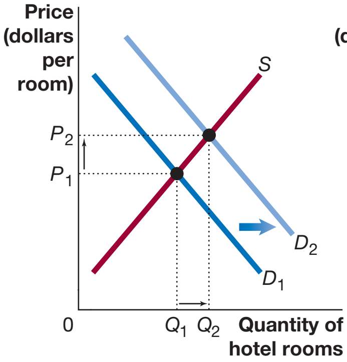
b. A drop in the average household income in the United States from \$56,000 to \$52,000

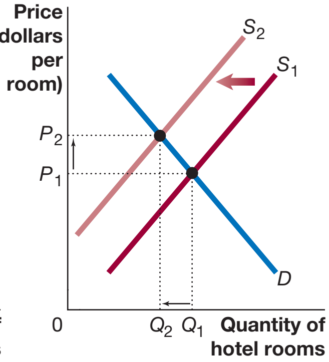
c. An improvement in the bottling technology for premium bottled water

d. An increase in the prices of electrolytes used in premium bottled water

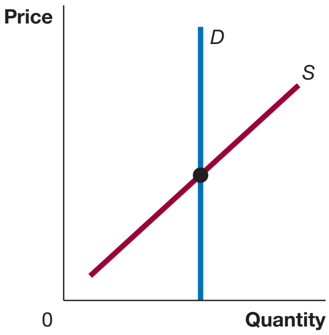
4.18 The city government of Washington, DC, has passed a regulation that requires most childcare workers to hold at least an associate's degree. Suppose that this regulation increases the quality of childcare and causes the demand for childcare services to increase. At the same time, assume that complying with the new government regulation increases the costs of firms providing childcare services. Draw a demand and supply graph to illustrate the effects of these changes in the market for childcare services. Briefly explain whether you can determine if the total quantity of childcare services purchased will increase or decrease as a result of the regulations.

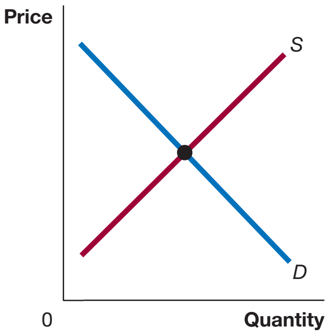
4.19 Which of the following graphs best represents what happens in the market for hotel rooms at a ski resort during the winter? Briefly explain. From the graph you picked, what would be the result during the winter if hotel rates stayed at their summer level?





4.20 The following graphs show the demand and supply curves for two markets. One of the markets is for electric automobiles, and the other is for a cancer-fighting drug, without which lung cancer patients will die. Briefly explain which graph most likely represents each market.





Critical Thinking Exercises

CT3.1 For this exercise, your instructor may assign you to a group. Which curve did you find more difficult to understand: the demand curve or the supply curve? Why did you have trouble understanding that curve? Working together, explain your thinking in a one-paragraph report you will either submit to your instructor or discuss with the rest of the class.

CT3.2 Review Figure 3.9 in Section 3.3, which shows the market for water bottles. The figure shows three different changes occurring: (1) a shift in a curve, (2) some event external to the market that affects the market, and (3) a new equilibrium. What is the order in which these three different changes occur? In the analysis of other markets that you will carry out later in the course, must the order of these three changes stay the same as in this example, or can the order be different?

4 Economic Efficiency, Government Price Setting, and Taxes

What Do Food Riots in Venezuela and the Rise of Uber in the United States Have in Common?

Carlos Garcia Rawlins/Reuters

What happened to Venezuela? Economists often measure the *standard of living* in a country by the income of the average person. In 1960, the income of the average person in Venezuela was only about 40 percent of the income of the average person in the United States. But the standard of living in Venezuela that year looked much better when compared with other large Latin American countries. Average incomes in Venezuela were more than twice as high as in Argentina and more than three times as high as in Brazil.

The situation in 2019 (the most recent year for which we have reliable data on income in Venezuela) was very different. In that year, average income in Venezuela had fallen by an astonishing 95 percent from its 1960 level and was far below average incomes in Argentina and Brazil. The reduced standard of living was accompanied by unrest. In some cities, crowds stormed supermarkets, and street gangs fought over food. The government had to send in troops to protect stores from looters.

In many U.S. cities, you can't legally operate a taxi unless you have a permit from the city government. For example, New York City requires a taxi driver to purchase a medallion. The number of medallions issued is limited, and in 2014, the price of a medallion reached $1.3 *million*. Today, though, many people have stopped using taxis and instead use a mobile app to book a ride from a firm such as Uber or Lyft. Drivers who want to work for these firms sign up, agree to meet certain requirements, and use their own vehicles to pick up riders. As riders began using these services, the price of a New York City taxi medallion fell, reaching a low of $137,000 in 2022. Similar declines occurred in other big cities. For example, in San Francisco, taxi drivers who had paid $250,000 for a medallion couldn't sell them at any price.

What's the connection between food riots in Venezuela and the rise of Uber in the United States? Both cases resulted from governments intervening to change equilibrium prices determined by the market. As we saw in Chapter 3, in a competitive market equilibrium, all consumers who are willing to pay the market price will be able to buy as much of the product as they want, and all firms that are willing to accept the market price will be able to sell as much of the product as they want. But consumers would rather pay a lower price than the market price, and firms would rather receive a higher price. In some cases, either buyers or sellers can convince the government to enact *price controls*, which are legally binding maximum or minimum prices. Beginning in 1999, the Venezuelan government took over many private businesses, which disrupted the supply of most goods, including food, to retail stores. As market prices rose due to the reductions in supply, the government imposed price controls. The result was food shortages that led to riots.

In cities such as New York and San Francisco, government limits on the supply of taxis pushed the price of a ride well above the competitive market level. High prices provided Travis Kalanick, the founder of Uber, and other entrepreneurs the opportunity to earn a profit by offering ride-hailing services at a lower price than taxis were charging.

As we'll see in this chapter, when governments interfere with the prices determined by markets, they create both winners and losers, and they typically reduce economic efficiency.

AN INSIDE LOOK at the end of the chapter explores the price controls that many European governments enacted in response to rising food prices.

Chapter Outline & Learning Objectives

4.1 Consumer Surplus and Producer Surplus, page 112
Distinguish between the concepts of consumer surplus and producer surplus.

4.2 The Efficiency of Competitive Markets, page 117
Explain the concept of economic efficiency.

4.3 Government Intervention in the Market: Price Floors and Price Ceilings, page 120
Explain the economic effect of government-imposed price floors and price ceilings.

4.4 The Economic Effect of Taxes, page 130
Analyze the economic effect of taxes.

Appendix: Quantitative Demand and Supply Analysis, page 148
Use quantitative demand and supply analysis.

Economics in Your Life & Career

As a Member of the City Council, Should You Support Rent Control?

Suppose you have been elected to your city council. A group of renters has become concerned that rising rents are making it difficult for them to find affordable apartments. They propose that the city council enact a rent control law that will keep rents in the future from rising above their current levels. If you and the other city council members vote to enact this law, is it likely that in the future it will be easier for renters to find affordable apartments in your city? Who in your city would benefit, and who would lose from this law? As you read the chapter, try to answer these questions. You can check your answers against the ones we provide at the end of this chapter.

In a competitive market, the price adjusts to ensure that the quantity demanded equals the quantity supplied. As a result, in equilibrium, every consumer willing to pay the market price is able to buy as much of the product as he or she wants, and every firm willing to accept the market price can sell as much as it wants. Consumers would naturally prefer to pay a lower price, and sellers would prefer to receive a higher price. Normally, consumers and firms have no choice but to accept the equilibrium price if they want to participate in the market.

Occasionally, however, consumers or firms persuade the government to intervene to try to lower or raise the market price of a good or service:

Price ceiling A legally determined maximum price that sellers may charge.

Price floor A legally determined minimum price that sellers may receive.

- Consumers sometimes succeed in having the government impose a **price ceiling**, which is a legally determined maximum price that sellers may charge. Rent control, which puts a legal limit on the rent that landlords can charge for an apartment, is an example of a price ceiling.
- Firms sometimes succeed in having the government impose a **price floor**, which is a legally determined minimum price that sellers may receive. In markets for farm products such as milk, the federal government has been setting price floors above the equilibrium market price since the 1930s.

Another way the government intervenes in markets is by imposing taxes. The government relies on the revenue raised from taxes to finance its operations. But taxes also affect the decisions that consumers and firms make.

Each of these government interventions reduces economic efficiency. Economists have developed the concepts of *consumer surplus, producer surplus*, and *deadweight loss* to help policymakers and voters analyze the economic effects of price ceilings, price floors, and taxes.

4.1 Consumer Surplus and Producer Surplus

LEARNING OBJECTIVE: Distinguish between the concepts of consumer surplus and producer surplus.

Consumer surplus measures the dollar benefit consumers receive from buying goods or services in a particular market. Producer surplus measures the dollar benefit firms receive from selling goods or services in a particular market. Economic surplus in a market is the sum of consumer surplus and producer surplus. As we will see, *when the government imposes a price ceiling or a price floor, the amount of economic surplus in a market is reduced*. In other words, price ceilings and price floors reduce the total benefit to consumers and firms from buying and selling in a market. To understand why, we need to understand how consumer surplus and producer surplus are determined.

Consumer Surplus

Consumer surplus The difference between the highest price a consumer is willing to pay for a good or service and the actual price the consumer pays.

Consumer surplus is the difference between the highest price a consumer is willing to pay for a good or service and the actual price the consumer pays. Suppose you want to stream the movie *Top Gun: Maverick*. Before you check the price to rent it on iTunes or Amazon, you decide that $6.99 is the highest price you are willing to pay. On iTunes, you find that the rental price is actually $4.99, so you rent the movie. Your consumer surplus in this example is $2: the difference between the $6.99 you were willing to pay and the $4.99 you actually paid.

We can use the demand curve to measure the total consumer surplus in a market. Demand curves show the willingness of consumers to purchase a product at different prices. Consumers are willing to purchase a product up to the point where the marginal benefit of consuming the product is equal to its price. The **marginal benefit** is the additional benefit to a consumer from consuming one more unit of a good or service. As a simple example, suppose there are only four consumers in the market for chai tea: Theresa, Tom, Terri, and Tim. Because these four consumers have different tastes for tea and different incomes, the marginal benefit each of them receives from consuming a cup

Marginal benefit The additional benefit to a consumer from consuming one more unit of a good or service.

Consumer	Highest Price Willing to Pay
Theresa	$6
Tom	5
Terri	4
Tim	3

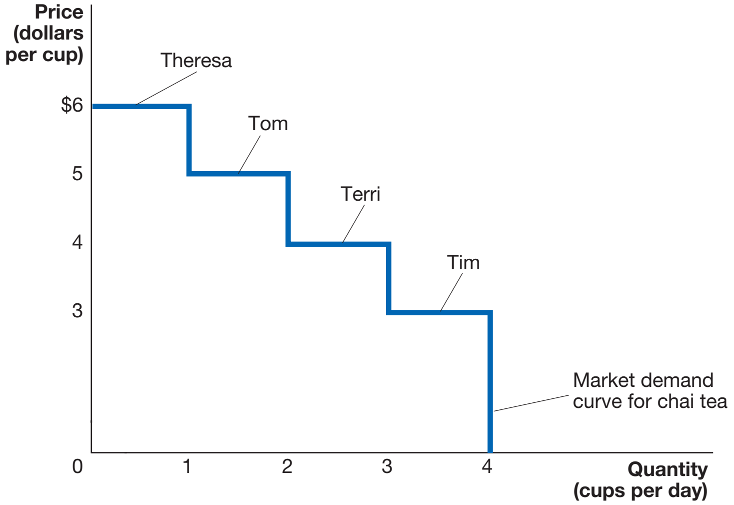


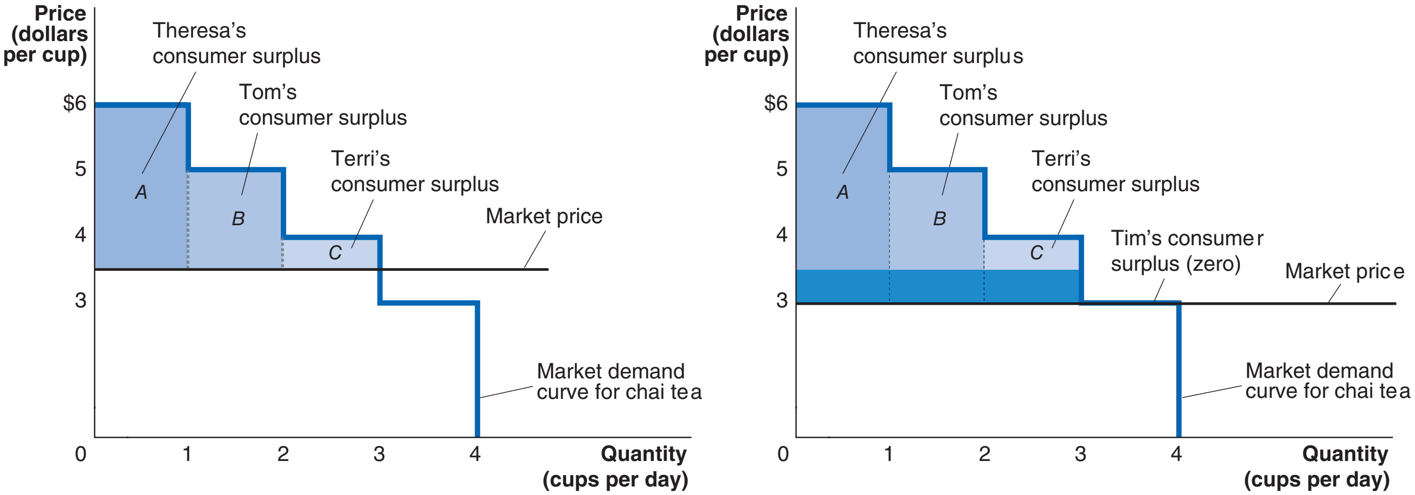
Figure 4.1

Deriving the Demand Curve for Chai Tea

With four consumers in the market for chai tea, the demand curve is determined by the highest price each consumer is willing to pay. At prices above $6, no tea is sold because $6 is the highest price any consumer is willing to pay. At prices of $3 and below, each of the four consumers is willing to buy one cup of tea.

of tea will be different. Therefore, the highest price each is willing to pay for a cup of tea is also different. In Figure 4.1, the information from the table is used to construct a demand curve for chai tea. At prices above $6 per cup, no tea is sold because $6 is the highest price any of the consumers is willing to pay. At a price of $5, both Theresa and Tom are willing to buy tea, so two cups are sold. At prices of $3 and below, all four consumers are willing to buy tea, and four cups are sold.

Suppose the market price of tea is $3.50 per cup. As Figure 4.2 shows, the demand curve allows us to calculate the total consumer surplus in this market. Panel (a) shows



(a) Consumer surplus with a market price of $3.50

(b) Consumer surplus with a market price of $3.00

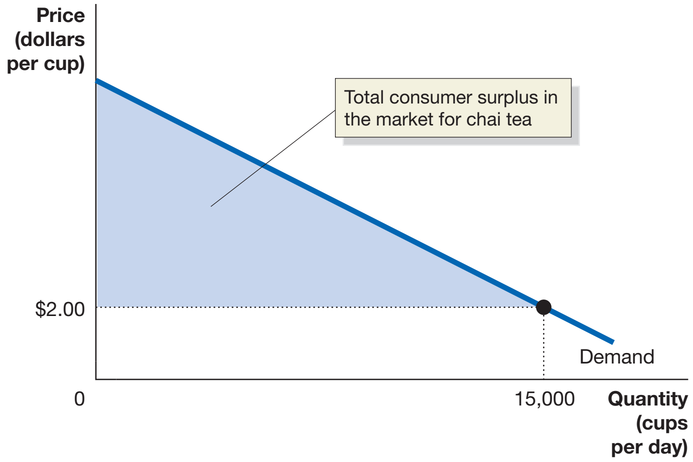
Figure 4.2 Measuring Consumer Surplus

Panel (a) shows the consumer surplus for Theresa, Tom, and Terri when the price of tea is $3.50 per cup. Theresa's consumer surplus is equal to the area of rectangle *A* and is the difference between the highest price she would pay—which is $6—and the market price of $3.50. Tom's consumer surplus is equal to the area of rectangle *B*, and Terri's consumer surplus is equal to the area of rectangle *C*. Total consumer surplus in this market is equal to the sum of the areas of rectangles *A*, *B*, and *C*, or the total area below the demand curve and above the market price. In panel (b), consumer surplus increases by the dark blue area as the market price declines from $3.50 to $3.00.

Figure 4.3

Total Consumer Surplus in the Market for Chai Tea

The demand curve shows that most buyers of chai tea would have been willing to pay more than the market price of $2.00. For each buyer, consumer surplus is equal to the difference between the highest price he or she is willing to pay and the market price actually paid. Therefore, the total amount of consumer surplus in the market for chai tea is equal to the area below the demand curve and above the market price. Consumer surplus represents the benefit to consumers in excess of the price they paid to purchase a product.



that the highest price Theresa is willing to pay is $6, but because she pays only $3.50, her consumer surplus is $2.50 (shown by the area of rectangle *A*). Similarly, Tom's consumer surplus is $1.50 (rectangle *B*), and Terri's consumer surplus is $0.50 (rectangle *C*). Tim is unwilling to buy a cup of tea at a price of $3.50, so he doesn't participate in this market and receives no consumer surplus. In this simple example, the total consumer surplus is equal to $2.50 + $1.50 + $0.50 = $4.50 (or the sum of the areas of rectangles *A*, *B*, and *C*). Panel (b) shows that a lower price will increase consumer surplus. If the price of tea falls from $3.50 per cup to $3.00, Theresa, Tom, and Terri each receive $0.50 more in consumer surplus (shown by the dark blue areas), so the total consumer surplus in the market rises to $6.00. Tim now buys a cup of tea but doesn't receive any consumer surplus because the price is equal to the highest price he is willing to pay. In fact, Tim is indifferent between buying the cup or not; his well-being is the same either way.

The market demand curves shown in Figures 4.1 and 4.2 do not look like the typical smooth demand curve because in this case we have only a small number of consumers, each consuming a single cup of tea. With many consumers, the market demand curve for chai tea will have the normal smooth shape shown in Figure 4.3. In this figure, the quantity demanded at a price of $2.00 is 15,000 cups per day. We can calculate total consumer surplus in Figure 4.3 the same way we did in Figures 4.1 and 4.2—by adding up the consumer surplus received on each unit purchased. Once again, we can draw an important conclusion: *The total amount of consumer surplus in a market is equal to the area below the demand curve and above the market price*. Consumer surplus, shown as the shaded area in Figure 4.3, represents the benefit to consumers in excess of the price they paid to purchase a product—in this case, chai tea.

Apply the Concept

The Consumer Surplus from Uber

Consumer surplus allows us to measure the benefit consumers receive in excess of the price they pay to purchase a product. As we noted in the chapter opener, in many cities, local governments have artificially reduced the quantity of taxi services supplied by legally restricting the number of taxis allowed to operate. The government restrictions on taxis generally do not apply to Uber, Lyft, and other ride-hailing services that use mobile apps. (However, some cities, including New York, have recently begun restricting the number of Uber or Lyft drivers who can operate in particular areas at the same time.) As a result, the services have become very popular among both drivers and riders. According to a public opinion poll, in 2015, only 15 percent of adults had ever used a ride-hailing app, and 33 percent had never even heard of these apps. By 2021, 22 percent of all adults and 39 percent of adults aged 18 to 29 had used a ride-hailing app, and fewer than 3 percent had never heard of these apps.

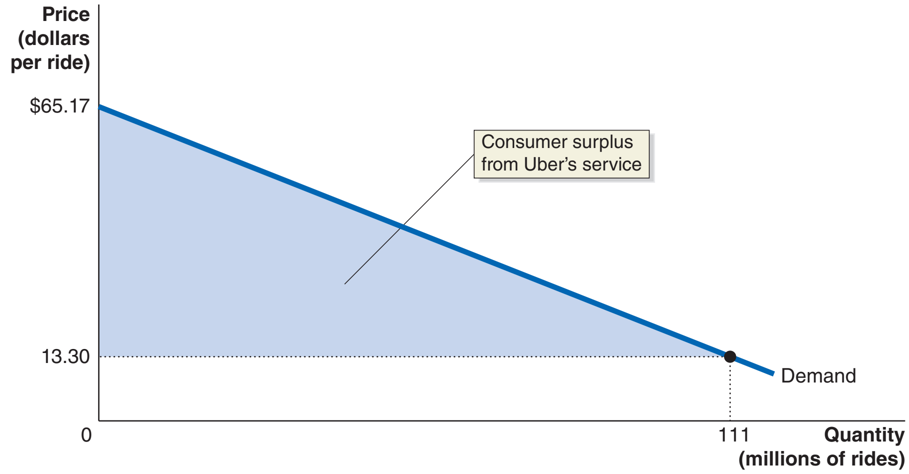
The enthusiastic consumer response to ride-hailing services indicates that these services have resulted in a substantial increase in consumer surplus. Peter Cohen and Jonathan Hall, economists who work for Uber, along with Robert Hahn of the University of Oxford, Steven Levitt of the University of Chicago, and Robert Metcalfe of Boston University, have estimated the consumer surplus attributed to Uber. Uber practices "surge pricing," which means that the firm varies the prices its drivers charge depending on the weather, the time of day, the availability of drivers in the area, and whether an event such as a football game or a New Year's Eve celebration is occurring. The firm has particularly good data available for economists to use in estimating its demand curve. Uber has information both on the quantity of rides accepted at a particular price and the quantity of rides not accepted because a potential rider decides that a surge price is higher than he or she wishes to pay.

The economists analyzed data on millions of instances of riders using the app to get pricing information for a potential trip—including both sessions where the rider went ahead, summoned a driver, and paid for a trip and sessions where the rider decided against making the trip. The data were for Uber's basic UberX service in its four largest markets: New York, San Francisco, Chicago, and Los Angeles. To carry out the analysis, the economists estimated the demand curve for Uber's service and then computed the shaded area shown in the following graph.

The economists analyzed data from a six-month period during which consumers took about 111 million trips using Uber in these four cities. The demand curve shows the marginal benefit consumers received from using Uber rather than making the trip some other way or not making the trip at all. The shaded area below the demand curve and above the $13.30 base price that Uber charges represents the difference between the price consumers would have paid rather than do without Uber's service and the $13.30 they did pay. The shaded area in the graph represents the total consumer surplus in the market for Uber's service. Cohen and his colleagues estimate that the value of this area is $2.88 billion per year. Extrapolating this result to the country as a whole, they estimate that the total consumer surplus from Uber was $6.76 billion. This value is one year's benefit to the consumers who used Uber's ride-hailing service.

Does consumer surplus measure the whole net benefit consumers receive from a good or service? Not necessarily because consumer surplus measures only the benefit consumers receive from paying a market price that is lower than the highest price they were willing to pay. Consumers may, however, receive additional benefits from a product.

For example, Michael Anderson and Lucas Davis of the University of California, Berkeley studied how the availability of ride-hailing services affects the number of traffic fatalities. About 30 percent of fatal automobile crashes involve alcohol. The availability of ride-hailing services in an area may reduce fatalities because some people who have consumed alcohol may decide to use Uber or Lyft rather than drive their own cars.



Note: The figure illustrates the approach of Cohen and his colleagues but doesn't reproduce it exactly. Among other simplifications, the figure assumes that the demand curve for Uber's service is linear.

Anderson and Davis analyzed data from the National Highway Traffic Safety Administration on the exact locations of fatal traffic accidents involving alcohol and data from Uber on the availability of its service in those locations. They estimate that the availability of Uber has reduced total U.S. traffic fatalities by about 4 percent. They lacked the data to calculate the effects of Lyft and other ride-sharing apps on fatalities, but presumably the total effect would be larger than a 4 percent reduction.

Although valuing a human life in monetary terms may seem distasteful, the U.S. Department of Transportation (DOT) does so in order to measure the effects of government regulations. Most government highway and traffic regulations impose costs by, for example, slowing the flow of traffic. By valuing the lives saved by a regulation, the DOT can compare the costs of a regulation to its benefits. In 2021, the DOT assigned a value of $11.8 million to a life saved by highway and traffic regulations. When this value is combined with the results from Anderson and Davis's study, Uber's effect on reducing traffic fatalities has an estimated value of about $5.8 billion per year. This amount is similar to the estimate given earlier of the consumer surplus from Uber.

Your Turn: For more practice do related problem 1.15 at the end of this chapter.

Producer Surplus

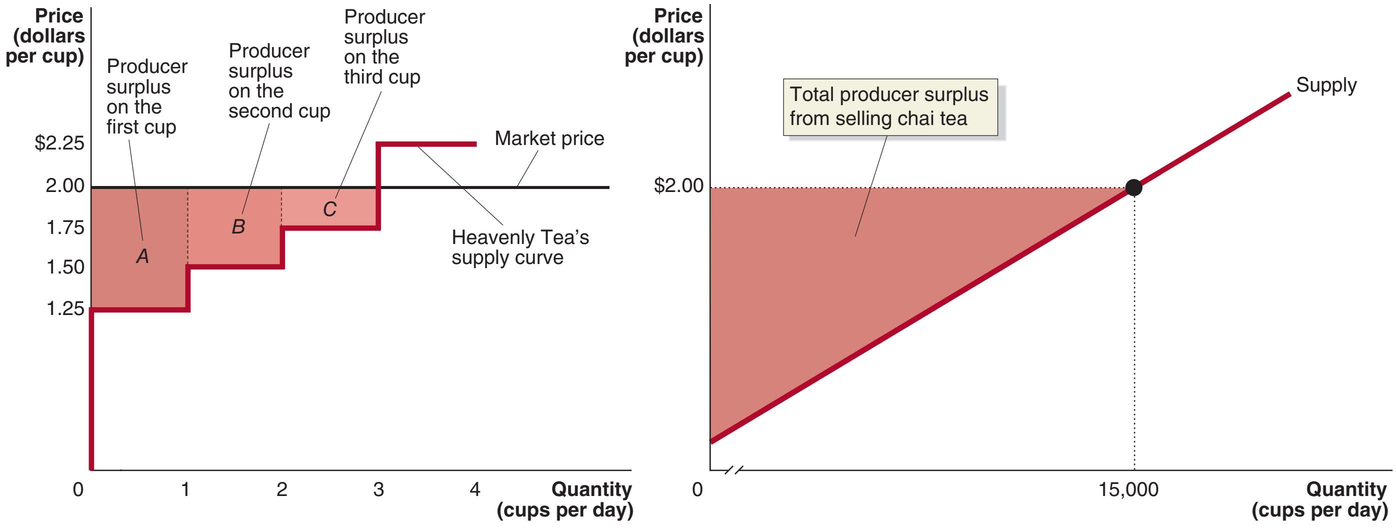
Just as demand curves show the willingness of consumers to buy a product at different prices, supply curves show the willingness of firms to supply a product at different prices. The willingness to supply a product depends on the cost of producing it. Firms will supply an additional unit of a product only if they receive a price equal to the additional cost of producing that unit. **Marginal cost** is the change in a firm's total cost from producing one more unit of a good or service. Consider the marginal cost to the firm Heavenly Tea of producing one more cup of tea: In this case, the marginal cost includes the ingredients to make the tea and the wages paid to the worker preparing the tea. Often, the marginal cost of producing a good increases as more of the good is produced during a given period of time. Increasing marginal cost is the key reason that supply curves are upward sloping.

Marginal cost The change in a firm's total cost from producing one more unit of a good or service.

Panel (a) of Figure 4.4 shows Heavenly Tea's producer surplus. For simplicity, we show Heavenly producing only a small quantity of tea. Heavenly's marginal cost of producing the first cup of tea is $1.25, its marginal cost of producing the second cup is $1.50, and so on. The marginal cost of each cup of tea is the lowest price Heavenly is willing to accept to supply that cup. The supply curve is therefore also a marginal cost curve. Suppose the market price of tea is $2.00 per cup. On the first cup of tea, the price is $0.75 higher than the lowest price that Heavenly is willing to accept. **Producer surplus** is the difference between the lowest price a firm would be willing to accept for a good or service and the price it actually receives. Therefore, Heavenly's producer surplus on the first cup is $0.75 (shown by the area of rectangle *A*), its producer surplus on the second cup is $0.50 (rectangle *B*), and its producer surplus on the third cup is $0.25 (rectangle *C*). Heavenly will not be willing to supply the fourth cup because the marginal cost of producing it is greater than the market price. Heavenly's total producer surplus is equal to $\$0.75 + \$0.50 + \$0.25 = \$1.50$ (which is the sum of the areas of rectangles *A*, *B*, and *C*). A higher price will increase producer surplus. For example, if the market price of chai tea rises from $2.00 to $2.25, Heavenly's producer surplus will increase from $1.50 to $2.25. (Make sure you understand how the new level of producer surplus was calculated.)

Producer surplus The difference between the lowest price a firm would be willing to accept for a good or service and the price it actually receives.

The supply curve shown in panel (a) of Figure 4.4 does not look like the typical smooth supply curve because we are looking at a single firm producing only a small quantity of tea. With many firms, the market supply curve for chai tea will have the normal smooth shape shown in panel (b) of Figure 4.4. In panel (b), the quantity supplied at a price of $2.00 is 15,000 cups per day. We can calculate total producer surplus in panel (b) the same way we did in panel (a): by adding up the producer surplus received on each cup sold. Therefore, *the total amount of producer surplus in a market is equal to the area above the market supply curve and below the market price*. The total producer surplus tea sellers receive from selling chai tea is shown as the shaded area in panel (b) of Figure 4.4.



(a) Producer surplus for Heavenly Tea

(b) Total producer surplus in the market for chai tea

Figure 4.4 **Measuring Producer Surplus**

Panel (a) shows Heavenly Tea's producer surplus. The lowest price Heavenly is willing to accept to supply a cup of tea is equal to its marginal cost of producing that cup. When the market price of tea is $2.00, Heavenly receives producer surplus of $0.75 on the first cup (the area of rectangle *A*), $0.50 on the second cup (rectangle *B*), and $0.25 on the third cup (rectangle *C*). In panel (b), the total amount of producer surplus tea sellers receive from selling chai tea can be calculated by adding up, for the entire market, the producer surplus received on each cup sold. In the figure, total producer surplus is equal to the shaded area above the supply curve and below the market price.

What Consumer Surplus and Producer Surplus Measure

We have seen that consumer surplus measures the benefit to consumers from participating in a market, and producer surplus measures the benefit to producers from participating in a market. It is important to be clear about what these concepts are measuring:

- Consumer surplus measures the *net* benefit to consumers from participating in a market rather than the *total* benefit. That is, if the price of a product were zero, the consumer surplus in a market would be all of the area under the demand curve. When the price is not zero, consumer surplus is the area below the demand curve and above the market price. So, consumer surplus in a market is equal to the total benefit consumers receive minus the total amount they must pay to buy the good or service.
- Producer surplus measures the *net* benefit producers receive from participating in a market. If producers could supply a good or service at zero cost, the producer surplus in the market would be all of the area below the market price. When cost is not zero, producer surplus is the area below the market price and above the supply curve. So, producer surplus in a market is equal to the total dollar amount firms receive from consumers minus the cost of producing the good or service.

4.2 The Efficiency of Competitive Markets

LEARNING OBJECTIVE: Explain the concept of economic efficiency.

Recall that a *competitive market* is a market with many buyers and many sellers. An important advantage of the market system is that it results in efficient economic outcomes. But what does *economic efficiency* mean? The concepts we have developed so far in this chapter give us two ways to think about the economic efficiency of competitive markets. We can think in terms of:

1. Marginal benefit and marginal cost
2. Consumer surplus and producer surplus

As we will see, these two approaches lead to the same outcome, but using both can increase our understanding of economic efficiency.

Marginal Benefit Equals Marginal Cost in Competitive Equilibrium

Figure 4.5 again shows the market for chai tea. Recall that the demand curve shows the marginal benefit consumers receive, and the supply curve shows the marginal cost of production. For this market to achieve economic efficiency, the marginal benefit from the last unit sold should equal the marginal cost of production. In the figure, this equality occurs at competitive equilibrium where 15,000 cups per day are produced and marginal benefit and marginal cost are both equal to $2.00. This outcome is economically efficient because every cup of chai tea has been produced where the marginal benefit to buyers is greater than or equal to the marginal cost to producers.

To further understand why the level of output at competitive equilibrium is efficient, consider what the situation would be if output were at a different level. Suppose that output of chai tea is 14,000 cups per day. Figure 4.5 shows that at this level of output, the marginal benefit from the last cup sold is $2.20, while the marginal cost is only $1.80. This level of output is not efficient because 1,000 more cups could be produced for which the additional benefit to consumers would be greater than the additional cost of production. Consumers would willingly purchase those cups, and tea sellers would willingly supply them, making both consumers and sellers better off. Similarly, if the output of chai tea is 16,000 cups per day, the marginal cost of the 16,000th cup is $2.20, while the marginal benefit is only $1.80. Tea sellers would only be willing to supply this cup at a price of $2.20, which is $0.40 higher than consumers would be willing to pay. In fact, consumers would not be willing to pay the price tea sellers would need to receive for any cup beyond the 15,000th.

To summarize: *Equilibrium in a competitive market results in the economically efficient level of output, at which marginal benefit equals marginal cost.*

Economic Surplus

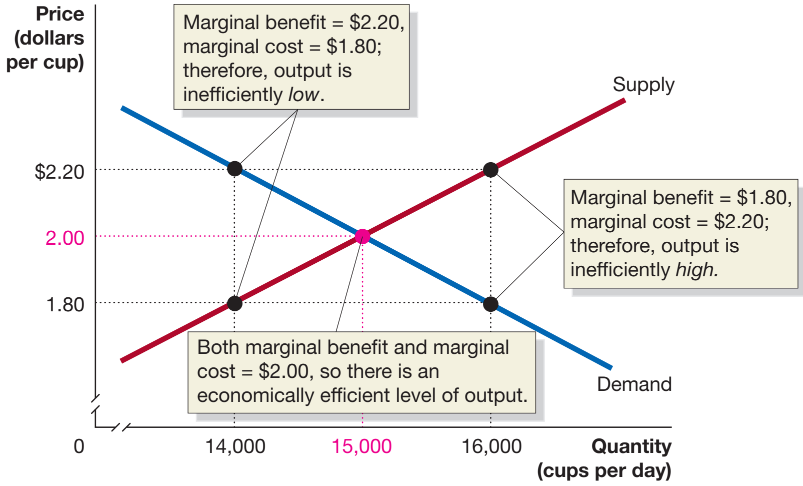
Economic surplus The sum of consumer surplus and producer surplus.

Economic surplus in a market is the sum of consumer surplus and producer surplus. In a competitive market, with many buyers and sellers and no government restrictions, economic surplus is at a maximum when the market is in equilibrium. To see this point, let's look at the market for chai tea, shown again in Figure 4.6. The consumer surplus in this market is the blue area below the demand curve and above the line indicating the equilibrium price of $2.00. The producer surplus is the red area above the supply curve and below the equilibrium price line.

Figure 4.5

Marginal Benefit Equals Marginal Cost Only at Competitive Equilibrium

In a competitive market, equilibrium occurs at a quantity of 15,000 cups and a price of $2.00 per cup, where marginal benefit equals marginal cost. This level of output is economically efficient because every cup has been produced for which the marginal benefit to buyers is greater than or equal to the marginal cost to producers.



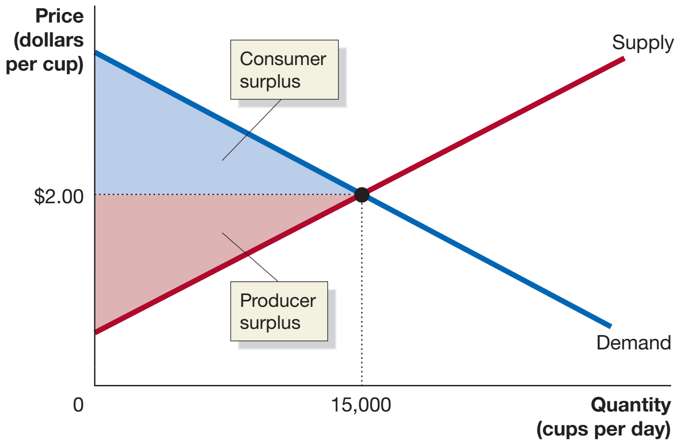


Figure 4.6

Economic Surplus Equals the Sum of Consumer Surplus and Producer Surplus

The economic surplus in a market is the sum of the blue area, representing consumer surplus, and the red area, representing producer surplus.

Deadweight Loss

To show that economic surplus is maximized at equilibrium, consider a situation in which the price of chai tea is *above* the equilibrium price, as shown in Figure 4.7. At a price of $2.20 per cup:

- The number of cups consumers are willing to buy per day falls from 15,000 to 14,000.
- Therefore, consumer surplus declines from the sum of areas *A*, *B*, and *C* to just the area of *A*.
- Because fewer cups are sold at a higher price, producer surplus changes from the sum of areas *D* and *E* at competitive equilibrium to the sum of areas *B* and *D*.
- The sum of consumer and producer surplus—economic surplus—has been reduced to the sum of the areas of *A*, *B*, and *D*.

Notice that the new economic surplus is less than the original economic surplus by an amount equal to the sum of triangles *C* and *E*. Economic surplus has declined because at a price of $2.20, all the cups between the 14,000th and the 15,000th, which would have been produced in competitive equilibrium, are not being produced. These "missing" cups are not providing any consumer or producer surplus, so economic surplus has declined. The reduction in economic surplus resulting from a market not being in competitive equilibrium is called the **deadweight loss**. In the figure, deadweight loss is equal to the sum of the triangles *C* and *E*.

Deadweight loss The reduction in economic surplus resulting from a market not being in competitive equilibrium.

	At Competitive Equilibrium	At a Price of $2.20
Consumer surplus	*A* + *B* + *C*	*A*
Producer surplus	*D* + *E*	*B* + *D*
Deadweight loss	None	*C* + *E*

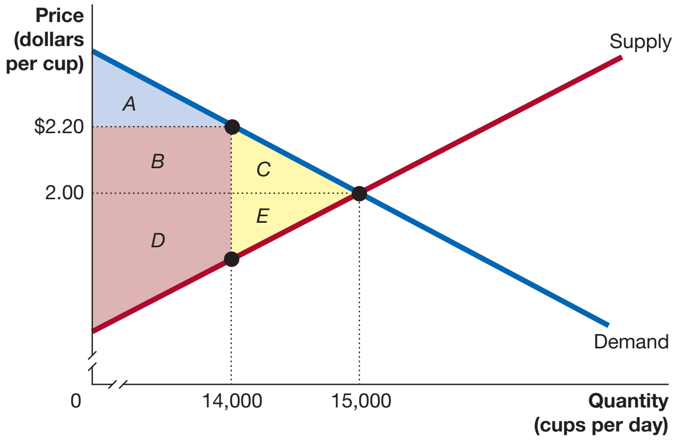


Figure 4.7

When a Market Is Not in Equilibrium, There Is a Deadweight Loss

Economic surplus is maximized when a market is in competitive equilibrium. When a market is not in equilibrium, there is a deadweight loss. For example, when the price of chai tea is $2.20 instead of $2.00, consumer surplus declines from an amount equal to the sum of areas *A*, *B*, and *C* to just area *A*. Producer surplus increases from the sum of areas *D* and *E* to the sum of areas *B* and *D*. At competitive equilibrium, there is no deadweight loss. At a price of $2.20, there is a deadweight loss equal to the sum of triangles *C* and *E*.

Economic Surplus and Economic Efficiency

Consumer surplus measures the benefit to consumers from buying a particular product, such as chai tea. Producer surplus measures the benefit to firms from selling a particular product. Therefore, economic surplus—which is the sum of the benefit to firms plus the benefit to consumers—is the best measure we have of the benefit to society from the production of a particular good or service. Economic surplus gives us a second way of characterizing the economic efficiency of a competitive market: *Equilibrium in a competitive market results in the greatest amount of economic surplus, or total net benefit to society, from the production of a good or service*. Anything that causes the market for a good or service not to be in competitive equilibrium reduces the total benefit to society from the production of that good or service.

Now we can give a more general definition of *economic efficiency* in terms of our two approaches: **Economic efficiency** is a market outcome in which the marginal benefit to consumers of the last unit produced is equal to its marginal cost of production and in which the sum of consumer surplus and producer surplus is at a maximum.

Economic efficiency A market outcome in which the marginal benefit to consumers of the last unit produced is equal to its marginal cost of production and in which the sum of consumer surplus and producer surplus is at a maximum.

4.3 Government Intervention in the Market: Price Floors and Price Ceilings

LEARNING OBJECTIVE: Explain the economic effect of government-imposed price floors and price ceilings.

Notice that we have *not* concluded that every *individual* is better off if a market is at competitive equilibrium. We have concluded only that economic surplus, or the *total* net benefit to society, is greatest at competitive equilibrium. Any individual producer would rather receive a higher price, and any individual consumer would rather pay a lower price, but usually producers can sell and consumers can buy only at the competitive equilibrium price.

Producers or consumers who are dissatisfied with the competitive equilibrium price can lobby the government to legally require that producers charge a different price. In the United States, the government only occasionally overrides the market outcome by setting prices. When the government does intervene, it can attempt to aid either sellers by requiring that a price be above equilibrium—a price floor—or aid buyers by requiring that a price be below equilibrium—a price ceiling. To affect the market outcome, the government must set a legal price floor that is above the equilibrium price or set a legal price ceiling that is below the equilibrium price. Otherwise, the price ceiling or price floor will not be *binding* on buyers and sellers. We can use the concepts of consumer surplus, producer surplus, and deadweight loss to understand more clearly why price floors and price ceilings reduce economic efficiency.

Price Floors: Government Policy in Agricultural Markets

The Great Depression of the 1930s was the worst economic disaster in U.S. history, affecting every sector of the economy and lasting for years. Many farmers could sell their products only at very low prices, and they convinced the federal government to set price floors for some agricultural products, such as wheat and corn. Government intervention in agriculture—often called the *farm program*—has continued ever since. To understand how a price floor in an agricultural market works, suppose that the equilibrium price in the wheat market is $6.50 per bushel, but the government sets a price floor of $8.00 per bushel. As Figure 4.8 shows, the price of wheat rises from $6.50 to $8.00, and the quantity of wheat sold falls from 2.0 billion bushels per year to 1.8 billion. Initially, suppose that production of wheat also falls to 1.8 billion bushels.

The producer surplus received by wheat farmers increases by an amount equal to the area of rectangle A and decreases by an amount equal to the area of triangle C. (This is the same result we saw in the market for chai tea in Figure 4.7.) The area of rectangle A represents a transfer from consumer surplus to producer surplus. The total fall in consumer

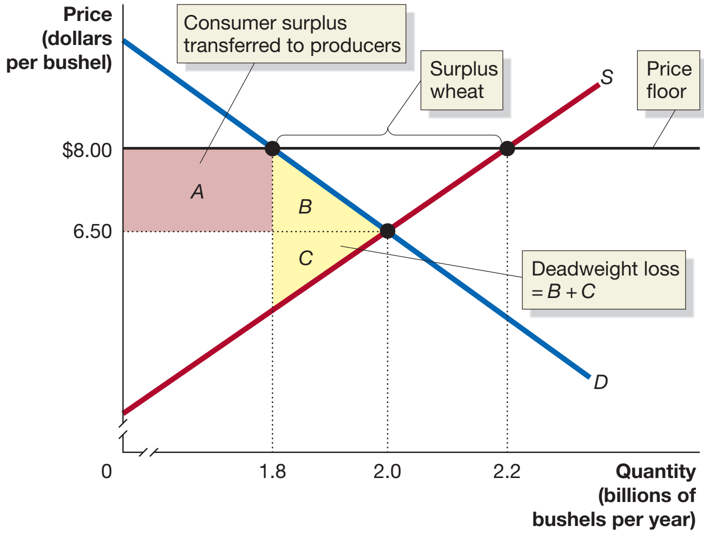


Figure 4.8

The Economic Effect of a Price Floor in the Wheat Market

If wheat farmers convince the government to impose a price floor of $8.00 per bushel, the amount of wheat sold will fall from 2.0 billion bushels per year to 1.8 billion. If we assume that farmers produce 1.8 billion bushels, producer surplus then increases by rectangle *A*—which is transferred from consumer surplus—and falls by triangle *C*. Consumer surplus declines by rectangle *A* plus triangle *B*. There is a deadweight loss equal to triangles *B* and *C*, representing the decline in economic efficiency due to the price floor. In reality, a price floor of $8.00 per bushel will cause farmers to expand their production from 2.0 billion to 2.2 billion bushels, resulting in a surplus of wheat.

surplus is equal to the sum of the areas of rectangle *A* and triangle *B*. Wheat farmers benefit from this program, but consumers lose. There is also a deadweight loss equal to the areas of triangles *B* and *C* because economic efficiency declines as the price floor reduces the amount of economic surplus in the market for wheat. In other words, the price floor has caused the marginal benefit of the last bushel of wheat to be greater than the marginal cost of producing it. We can conclude that a price floor reduces economic efficiency.

We assumed initially that farmers reduce their production of wheat to the amount consumers are willing to buy at the higher price. In fact, as Figure 4.8 shows, a price floor will cause the quantity of wheat that farmers want to supply to increase from 2.0 billion to 2.2 billion bushels. Because the higher price also reduces the amount of wheat consumers want to buy, the result is a surplus of 0.4 billion bushels of wheat (the 2.2 billion bushels supplied minus the 1.8 billion demanded).

The federal government's farm program has often resulted in large surpluses of wheat and other agricultural products. In response, the government has usually either bought the surplus food or paid farmers to restrict supply by taking some land out of cultivation. Because both of these options are expensive, Congress passed the Freedom to Farm Act of 1996. The intent of the act was to phase out price floors and government purchases of surpluses and return to a free market in agriculture. To allow farmers time to adjust, the federal government began paying farmers *subsidies*, or cash payments based on the number of acres planted. Although the subsidies were originally scheduled to be phased out, Congress has passed additional farm bills that have resulted in the continuation of subsidies requiring substantial federal government spending. In 2022, the Congressional Budget Office estimated that the farm program would result in federal spending of about $1.3 trillion over the following 10 years. Note that because it wastes resources that would otherwise be available for other uses, the farm program increases the deadweight loss from price floors in agricultural markets to an amount greater than the areas of triangles *B* and *C* in Figure 4.8.

Price Floors in Labor Markets: The Debate over Minimum Wage Policy

The minimum wage may be the most controversial "price floor." Supporters see the minimum wage as a way of raising the incomes of low-skilled workers. Opponents argue that it results in fewer jobs and imposes large costs on small businesses.

Since 2009, the national minimum wage as set by Congress has been $7.25 per hour for most occupations. It is illegal for an employer to pay less than this wage in these occupations. Although fewer than 2 percent of workers in the United States earn the minimum wage or less, many people are concerned that workers who receive the minimum wage or a wage a little above the minimum are not earning a "living wage" that would allow them to escape poverty.

In 2023, many cities and states had minimum wages above the federal level, including:

- Seattle, \$18.69 per hour
- Los Angeles, \$16.04 per hour
- Chicago and New York City, \$15 per hour
- California and Massachusetts, \$15 per hour
- Hawaii, Missouri, New Mexico, and Virginia, \$12 per hour

For many workers, the legal minimum wage is irrelevant because it is well below the wage employers are voluntarily willing to pay them. But for some low-skilled workers—such as restaurant workers—the minimum wage is above the wage they would otherwise receive. Figure 4.9 shows the effect of the minimum wage on employment in the market for low-skilled labor.

Figure 4.9 shows that without a minimum wage, the equilibrium wage would be W_1, and the number of workers hired would be L_1. With a minimum wage set above the equilibrium wage, the quantity of labor employers demand declines from L_1 to L_2, and the quantity of labor supplied increases to L_3, leading to a surplus of labor equal to $L_3 - L_2$. The quantity of labor supplied increases because the higher wage attracts more people to work. For instance, some teenagers may decide that working after school is worthwhile at the minimum wage of \$7.25 per hour but not worthwhile at a lower wage. The surplus of labor in this market represents workers who are unable to find jobs because the minimum wage is higher than the equilibrium wage.

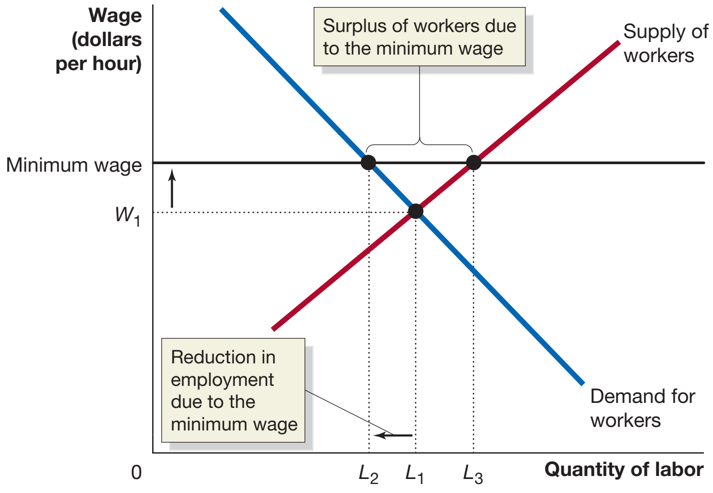
This analysis is very similar to our analysis of the wheat market in Figure 4.8. Just as a price floor in the wheat market leads to less wheat being consumed, a price floor in the labor market should lead to fewer workers being hired. Economists have drawn sharply different conclusions, however, about how large a reduction in employment the minimum wage causes. In 2022, the U.S. Congressional Budget Office (CBO) estimated that raising the federal minimum wage to \$15 by 2027 would result in a decline in employment of about 500,000 workers. Some economists, including David Card of the University of California, Berkeley and the late Alan Krueger of Princeton University, who conducted a study of fast-food restaurants in New Jersey and Pennsylvania, argue that minimum wage increases have only a very small effect on employment. (The following *Apply the Concept* "What Do Natural Experiments Tell Us about the Effects of the Minimum Wage?" discusses the Card and Krueger study.)

Ekaterina Jardim and colleagues at the University of Washington conducted a widely discussed study of the effects of Seattle raising its minimum wage in 2015 and 2016. They estimate that hours worked in low-wage jobs fell by 6 to 7 percent, although employment in low-wage jobs in the restaurant industry did not decline. They found that younger

Figure 4.9

The Effect of a Minimum Wage on the Labor Market

Without a minimum wage, the equilibrium wage would be W_1, and the number of workers hired would be L_1. With a minimum wage, the quantity of labor employers demand declines from L_1 to L_2, and the quantity of labor supplied increases to L_3, leading to a surplus of labor equal to $L_3 - L_2$. This surplus of labor represents workers who are unable to find jobs.



workers newly entering the labor market had difficulty finding unskilled jobs, such as busing tables in restaurants.

Whatever the extent of employment losses from the minimum wage, because it is a price floor, it will cause a deadweight loss, just as a price floor in the wheat market does. Therefore, some economists favor alternative policies for attaining the goal of raising the incomes of low-skilled workers. One policy many economists support is the *Earned Income Tax Credit* (*EITC*), which reduces the amount of tax that low-income wage earners pay to the federal government. Workers with very low incomes who do not owe any tax receive a payment from the government. Unlike with the minimum wage, the EITC can increase the incomes of low-skilled workers without reducing employment. The EITC also places a lesser burden on the small businesses that employ many low-skilled workers and may cause a smaller loss of economic efficiency.

Apply the Concept

What Do Natural Experiments Tell Us about the Effects of the Minimum Wage?

Starting in the 1940s, the increased availability of modern computers made it possible for economists to apply *econometric techniques*—which are advanced statistical methods—to analyze real-world data. For example, a labor economist might estimate a model of the demand and supply of labor to predict the effect of an increase in the minimum wage on employment. Many economists eventually became dissatisfied with this approach because of the amount of information it required. Formal economic models require assumptions about the details of an economic relationship, such as the demand for labor, that are not specified exactly by economic theory. Theory also doesn't always identify all the variables that should be included in a model. Gathering data on the relevant variables is sometimes difficult.

Many empirical questions require researchers to estimate causal relationships. They might consider, for example, the effect of a change in one variable—such as the minimum wage—on another variable—such as employment. It can be difficult to identify how one variable affects another variable because the values of several economic variables may be changing during the same period of time. (You may want to review the section "Determining Cause and Effect" in the appendix to Chapter 1.)

In recent years, some economists have developed new approaches to estimating causal economic relationships. David Card of the University of California, Berkeley, Joshua Angrist of the Massachusetts Institute of Technology, and Guido Imbens of Stanford University shared the 2021 Nobel Prize in Economics for pioneering the use of *natural experiments*, one of these new approaches.

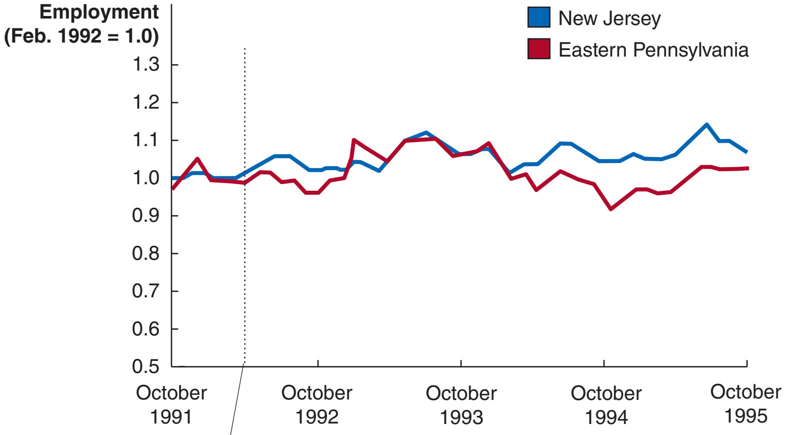
With a natural experiment, economists identify some variable of interest—say, an increase in the minimum wage—that has changed for one group of people (such as fast-food workers in one state), while remaining unchanged for another similar group of people (such as fast-food workers in a neighboring state). Researchers can estimate the effects of the change by looking at the difference between the outcomes for the two groups. In this example, the difference between changes in employment at fast-food restaurants in the two states can be used to measure the effect of an increase in the minimum wage.

In the study we mentioned in the previous section, David Card and Alan Krueger analyzed the effect of changes in the minimum wage on employment in fast-food restaurants by comparing what happened to employment in New Jersey when it raised the state minimum wage from $4.25 to $5.05 per hour in April 1992 with employment in eastern Pennsylvania, where the minimum wage remained unchanged. Most previous studies had concluded that increases in the minimum wage led to decreases in the employment of unskilled workers. But Card and Krueger found that employment of fast-food workers in New Jersey actually *increased* relative to employment of fast-food workers in Pennsylvania.

The following figure, which is adapted from a similar figure on the Nobel Prize website, illustrates the results of Card and Krueger's minimum wage study:

- The blue line represents employment in fast-food restaurants in New Jersey in April 1992 relative to the level of employment in those restaurants in October 1991.
- The red line shows the same for fast-food restaurants in eastern Pennsylvania.

Note that for much of the period following the minimum wage increase, employment in New Jersey (the blue line) increased relative to employment in Pennsylvania (the red line).



In April 1992, the hourly minimum wage in New Jersey increased from $4.25 to $5.05. That increase did not reduce employment in New Jersey fast-food restaurants.

Not all economists have accepted the results of Card and Krueger's study. Other economists have examined similar data and have concluded that an increase in minimum wage in the fast-food industry does lead to a significant decrease in employment.

Drawing inferences from natural experiments is not as straightforward as it might seem from our brief description. Angrist and Imbens helped develop the techniques that many economists rely on when analyzing data from natural experiments. Taken together, the work of these economists represents a revolution in empirical economics that provides economists with an approach and analytical techniques they can apply to a wide range of empirical questions.

Your Turn: Test your understanding by doing related problem 3.10 at the end of this chapter.

Price Ceilings: Government Rent Control Policy in Housing Markets

Support for governments setting price floors typically comes from sellers, and support for governments setting price ceilings typically comes from consumers. For example, when there is a sharp increase in gasoline prices, some policymakers and consumer groups will propose that the government impose a price ceiling on the market for gasoline. A number of cities impose rent control, which puts a ceiling on the maximum rent that landlords can charge for an apartment.

Figure 4.10 shows the market for apartments in a city that has rent control. Without rent control, the equilibrium rent would be $2,500 per month, and 2,000,000 apartments would be rented. With a maximum legal rent of $1,500 per month, landlords reduce the quantity of apartments supplied to 1,900,000. The fall in the quantity of apartments supplied may be the result of landlords converting some apartment buildings into offices, selling off apartments as condominiums, or converting multi-unit buildings into single-family homes. During World War II, government imposition of rent controls resulted in the largest increase in home ownership in U.S. history as some landlords sold off rental housing that they could no longer profitably rent to tenants.

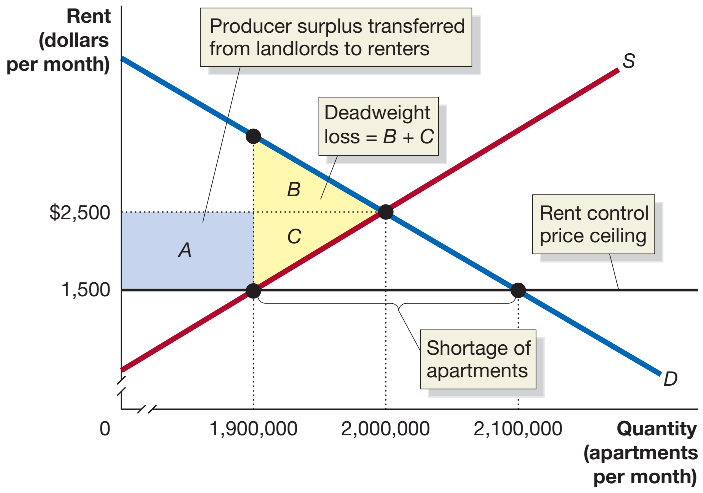


Figure 4.10

The Economic Effect of a Rent Ceiling

Without rent control, the equilibrium rent is $2,500 per month. At that price, 2,000,000 apartments would be rented. If the government imposes a rent ceiling of $1,500 per month, the quantity of apartments supplied decreases to 1,900,000, and the quantity of apartments demanded increases to 2,100,000, resulting in a shortage of 200,000 apartments. Producer surplus equal to the area of rectangle *A* is transferred from landlords to renters, and there is a deadweight loss equal to the areas of triangles *B* and *C*.

Over time, landlords may even abandon some rental housing. At one time in New York City, rent control resulted in landlords abandoning whole city blocks of apartment houses because they were unable to cover their costs with the rents the government allowed them to charge. In London, when rent controls were applied to rooms and apartments located in a landlord's own home, the quantity of these apartments supplied decreased by 75 percent.

In Figure 4.10, with the rent ceiling of $1,500 per month, the quantity of apartments demanded rises to 2,100,000, resulting in a shortage of 200,000 apartments. Consumer surplus increases by rectangle *A* and falls by triangle *B*. Rectangle *A* would have been part of producer surplus if rent control had not been in place. With rent control, it is part of consumer surplus. Rent control causes the producer surplus that landlords receive to fall by rectangle *A* plus triangle *C*. Triangles *B* and *C* represent the deadweight loss, which results from rent control reducing the amount of economic surplus in the market for apartments. Rent control has caused the marginal benefit of the last apartment rented to be greater than the marginal cost of supplying it. We can conclude that a price ceiling, such as rent control, reduces economic efficiency.

The appendix to this chapter shows how we can make quantitative estimates of the deadweight loss and provides an example of the changes in consumer surplus and producer surplus that can result from rent control.

Renters as a group benefit from rent control—as total consumer surplus is larger—but landlords lose. Because of the deadweight loss, the total loss to landlords is greater than the gain to renters. Notice also that although renters as a group benefit, the number of renters is reduced, so some renters are made worse off by rent controls because they are unable to find an apartment at the legal rent.

Don't Let This Happen to You

Don't Confuse "Scarcity" with "Shortage"

At first glance, the following statement seems correct: "There is a shortage of every good that is scarce." In everyday conversation, we describe a good as "scarce" if we have trouble finding it. For example, if during the holidays you want to buy the latest hot toy for a child but can't find it for sale online or in a store, you might call that toy "scarce." But recall that economists have a broader definition of *scarce*. In the economic sense, almost everything—except undesirable things like garbage—is scarce. A shortage of a good occurs only if the quantity demanded is greater than the quantity supplied at the current price. Therefore, the statement "There is a shortage of every good that is scarce" is incorrect. In fact, there is no shortage of most scarce goods.

Your Turn: Test your understanding by doing related problem 3.13 at the end of this chapter.

Illegal Markets and Peer-to-Peer Sites

When governments regulate prices by enacting price ceilings or price floors, buyers and sellers often make deals to get around the regulations. As a result, renters may be worse off and landlords may be better off than Figure 4.10 makes it seem. We have assumed that renters and landlords actually abide by the price ceiling, but sometimes they don't. Because rent control leads to a shortage of apartments, renters who would otherwise not be able to find apartments have an incentive to offer landlords rents *above* the legal maximum. The result is an **illegal market** in which buying and selling take place at prices that violate government price regulations.

Illegal market A market in which buying and selling take place at prices that violate government price regulations.

Online peer-to-peer rental sites like Airbnb have provided landlords and tenants another way to avoid rent controls. Landlords can use these sites to convert a regular yearly rental into a series of short-term rentals for which they can charge above the legal maximum rent. Tenants can also use the sites to make a profit from rent controls. In San Francisco, some tenants have moved out of the city but have kept their rent-controlled apartments and have rented them using peer-to-peer rental sites. Both San Francisco and New York have regulated peer-to-peer rental sites because some government officials believe the sites undermine rent control. Both cities have laws that prohibit landlords from renting apartments for less than 30 days. San Francisco also requires anyone renting rooms through Airbnb and similar sites to pay the city's 14 percent hotel tax.

Solved Problem 4.3

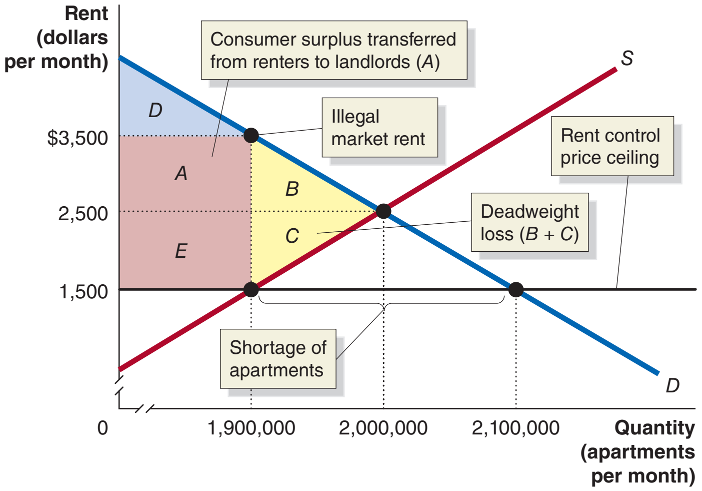
What's the Economic Effect of an Illegal Market in Renting Apartments?

In many cities that have rent controls, such as New York and San Francisco, the actual rents paid can be much higher than the legal maximum. Because rent controls cause a shortage of apartments, desperate tenants are often willing to pay landlords rents that are higher than the law allows, perhaps by writing a check for the legally allowed rent and paying an additional amount in cash. Look again at Figure 4.10. Suppose that competition among tenants results in the illegal market rent rising to $3,500 per month. At this rent, tenants demand 1,900,000 apartments. Draw a graph showing the market for apartments in this situation and compare your graph with the one shown in Figure 4.10. Be sure to note any differences in consumer surplus, producer surplus, and deadweight loss.

Solving the Problem

Step 1: Review the chapter material. This problem is about price controls in the market for apartments, so you may want to review the section "Price Ceilings: Government Rent Control Policy in Housing Markets."

Step 2: Draw a graph similar to Figure 4.10, with the addition of the illegal market price.



Step 3: **Analyze the changes from** Figure 4.10. The illegal market rent is now \$3,500 per month—even higher than the original competitive equilibrium rent shown in Figure 4.10. So, consumer surplus declines by an amount equal to the sum of the areas of rectangle *A* and rectangle *E*. The remaining consumer surplus is triangle *D*. Note that rectangle *A*, which would have been part of consumer surplus without rent control, represents a transfer from renters to landlords. Compared with the situation shown in Figure 4.10, producer surplus has increased by an amount equal to the sum of the areas of rectangles *A* and *E*, and consumer surplus has declined by the same amount. Deadweight loss is equal to the sum of the areas of triangles *B* and *C*, the same as in Figure 4.10.

Extra Credit: This analysis leads to a surprising result: With an active illegal market in apartments, rent control may leave renters as a group *worse off*—with less consumer surplus—than if there were no rent control. There is one more possibility to consider, however. If enough landlords become convinced that they can get away with charging rents above the legal ceiling, the quantity of apartments supplied will increase. Eventually, the market could even end up at the competitive equilibrium, with an equilibrium rent of \$2,500 and equilibrium quantity of 2,000,000 apartments. In that case, the rent control price ceiling becomes nonbinding—not because it is set below the equilibrium price but because the government doesn't effectively enforce it.

Your Turn: For more practice, do related problem 3.14 at the end of this chapter.

Rent controls can also lead to an increase in racial and other types of illegal discrimination. In a city with rent control, more renters are looking for apartments than there are apartments to rent. Landlords are more likely to indulge their prejudices by refusing to rent to people from groups they don't like, even if doing so is illegal. In cities without rent controls, landlords face greater competition, which makes it more difficult to reject tenants on the basis of irrelevant characteristics, such as race.

The Results of Government Price Controls: Winners, Losers, and Inefficiency

When the government imposes price floors or price ceilings, three important results occur:

1. **Some people win.** For example, the winners from rent control are the people who are paying less for rent because they live in rent-controlled apartments. Landlords may also gain if they break the law by charging rents above the legal maximum for their rent-controlled apartments, provided that those illegal rents are higher than the competitive equilibrium rents would be.
2. **Some people lose.** The losers from rent control are the landlords of rent-controlled apartments who abide by the law and renters who are unable to find apartments to rent at the controlled price.
3. **There is a loss of economic efficiency.** Rent control reduces economic efficiency because fewer apartments are rented than would be rented in a competitive market (refer again to Figure 4.10). The resulting deadweight loss measures the decrease in economic efficiency.

Apply the Concept

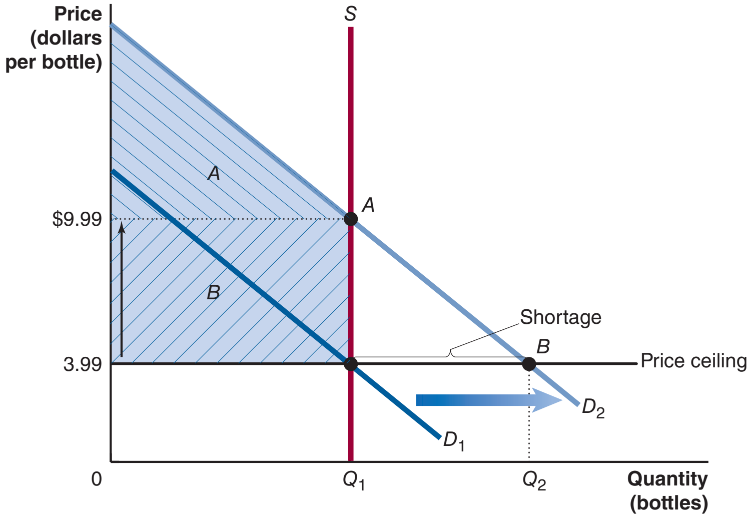
Should the Government Limit "Price Gouging" during an Emergency?

In early 2020, as the Covid–19 pandemic spread through the United States, people flocked to supermarkets and pharmacies to buy hand sanitizer, disinfectant wipes, and toilet paper. By March, these products had largely disappeared from store shelves. People who hoped to buy them on Amazon or eBay found that sellers were charging prices far above normal.

For instance, sellers on Amazon were charging $99.95 for large bottles of hand sanitizer that normally sell for $9.95. Substantial increases in the prices of essential goods, particularly during an emergency, is called *price gouging* and is against the law in 34 states. Many people consider price gouging immoral because it makes it difficult for people to afford essential goods during an emergency. Laws against price gouging typically set a price ceiling at the price of a good before the emergency began. What economic effect do price gouging laws have? It's useful to distinguish the very short run, during which it isn't possible to produce more of the good, and the medium run, when additional production is possible.

The Effect of Price Gouging Laws in the Very Short Run

The following figure shows the market for hand sanitizer in the very short run of a few weeks. Assume that the price of an 8-ounce bottle of hand sanitizer prior to the pandemic was $3.99. The normal level of demand is shown as demand curve D_1. In the very short run, the supply of hand sanitizer is fixed at the quantity currently available at retail stores and on online sites such as Amazon, Q_1. We show this fixed quantity as the vertical supply curve *S*.



The increased demand for hand sanitizer resulting from the pandemic shifts the demand curve to the right, from D_1 to D_2. In the absence of price gouging laws, the price will rise from $3.99 to a higher price, which we'll assume is $9.99. Laws against price gouging (if they are enforced) will impose a price ceiling at $3.99. The result of the price ceiling is a shortage equal to the difference between the new quantity demanded, Q_2, and the fixed supply, Q_1. The price ceiling results in consumers receiving consumer surplus equal to the area below demand curve D_2 and above the price of $3.99, shown in the figure as the sum of areas *A* and *B*. If there is no price ceiling and the equilibrium price rises to $9.99, area *B* will become part of producer surplus, reducing consumer surplus to just area *A*. Sellers will have gained from the higher price at the expense of buyers.

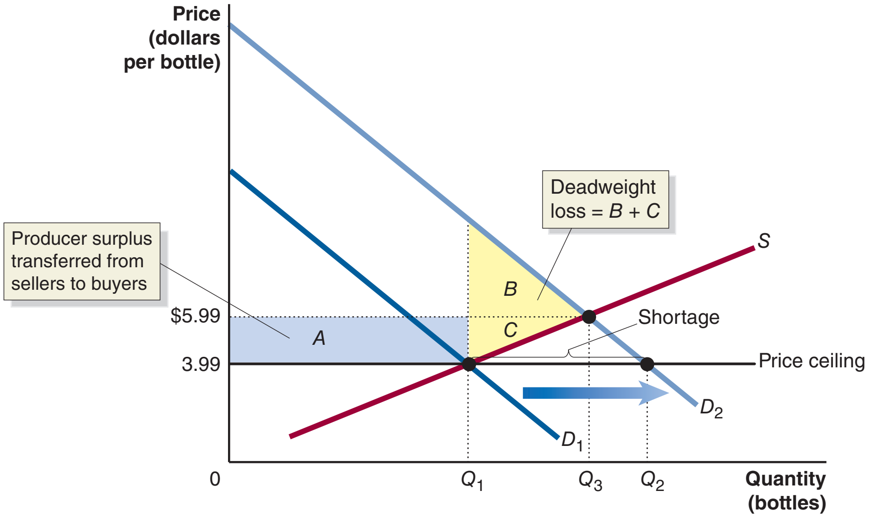
Remember, though, that in a market system, prices play an important role in directing resources to their most valuable use. If the equilibrium price rises to $9.99, at point

A on D_2, the marginal benefit from the last bottle of sanitizer sold is equal to its price, which is the economically efficient outcome. With the imposition of a price ceiling, some buyers whose marginal benefits are represented by the values along D_2 between point *A* and point *B* may buy bottles of sanitizer, while some buyers with a higher marginal benefit may be unable to. Consider a bus driver or police officer who does not have easy access to soap and water. These people would be willing to pay $9.99 for sanitizer but may be unable to find any because of the shortage resulting from the price ceiling.

Someone with a low income may have greater difficulty paying $9.99 than would someone with a high income. So, holding everything else constant, we might expect that without a price ceiling, more people with high incomes than people with low incomes will be able to buy sanitizer. This consideration leads many people to support laws against price gouging, even if they know that the laws reduce economic efficiency.

The Effect of Price Gouging Laws in the Medium Run

The following figure shows the more familiar situation when the time period is long enough for firms to increase production of hand sanitizer. (Note that this figure is similar to Figure 4.10.) In this case, as demand shifts to the right because of the pandemic, from D_1 to D_2, in the absence of a price ceiling, the price will increase from $3.99 per bottle to $5.99 per bottle, and the equilibrium quantity of bottles will increase from Q_1 to Q_3.



The supply curve, *S*, is upward sloping because we would expect that firms' marginal cost—the additional cost of producing another bottle—will increase as they expand output. For example, in March 2020, an article in the *Wall Street Journal* described how EO Products, located in San Rafael, California, quadrupled its output of hand sanitizer by "running extra shifts, speeding up lines, hiring temporary workers and converting factory lines designed for other products to make hand sanitizer instead." These actions made it possible for EO to increase the quantity of sanitizer it supplied but meant that the firm's marginal cost of production was increasing.

A price gouging law that kept the price of hand sanitizer fixed at $3.99 per bottle would result in the quantity of sanitizer supplied remaining at Q_1, causing a shortage equal to the difference between Q_2 and Q_1. Note that the price ceiling eliminates the incentive for firms to increase production of sanitizer. When marginal cost is increasing, firms will ordinarily need to receive a higher price in order to increase production.

The price ceiling causes consumer surplus to increase by the area of rectangle *A* and fall by the area of rectangle *B*. Rectangle *A* would have been part of producer surplus in the absence of the price ceiling. In that sense, the price ceiling benefits buyers at the expense of sellers. Compared with the situation in which the price is allowed to rise to $5.99, producer surplus declines by the area of *A* plus the area of *C*. The areas of triangles *B* and *C* represent deadweight loss, or the reduction in economic surplus resulting from the imposition of the price ceiling resulting from the price gouging law.

We can summarize the effects of the price gouging law shown in the figure:

1. Consumers who are able to buy the sanitizer at the ceiling price of $3.99 gain.
2. Consumers who would be able to buy the sanitizer at the equilibrium price of $5.99 but are unable to find any at the ceiling price of $3.99 lose.
3. Sellers experience a loss of producer surplus.
4. Economic efficiency is reduced by an amount equal to the deadweight loss.

Your Turn: Test your understanding by doing related problem 3.15 at the end of this chapter.

Positive and Normative Analysis of Price Ceilings and Price Floors

Are rent controls, the federal government's farm program, and other price ceilings and price floors bad? As we saw in Chapter 1, questions of this type do not have right or wrong answers. Economists are generally skeptical of government attempts to interfere with competitive market equilibrium. Economists know the role competitive markets have played in raising the average person's standard of living. They also know that too much government intervention has the potential to reduce the ability of the market system to produce similar increases in living standards in the future. The situation in Venezuela today appears to fit this description.

But recall the difference between positive and normative analysis from Chapter 1, Section 1.3. Positive analysis is concerned with *what is,* and normative analysis is concerned with *what should be*. Our analysis in this chapter of rent control and the federal farm program is positive analysis. We discussed the economic results of these policies. Whether these policies are desirable or undesirable is a normative question. Whether the gains to the winners more than make up for the losses to the losers and for the decline in economic efficiency is a matter of judgment and not strictly an economic question. Price ceilings and price floors continue to exist partly because people who understand their downside still believe they are good policies and therefore support them. The policies also persist because many people who support them do not understand the economic analysis in this chapter and so do not understand the drawbacks to these policies.

4.4 The Economic Effect of Taxes

LEARNING OBJECTIVE: Analyze the economic effect of taxes.

Supreme Court Justice Oliver Wendell Holmes once remarked, "Taxes are what we pay for a civilized society." When the government taxes a good or service, however, it affects the market equilibrium for that good or service. Just as with a price ceiling or a price floor, one result of a tax is a decline in economic efficiency. Analyzing taxes is an important part of the field of economics known as *public finance*. In this section, we will use the model of demand and supply and the concepts of consumer surplus, producer surplus, and deadweight loss to analyze the economic effect of taxes.

The Effect of Taxes on Economic Efficiency

Whenever a government taxes a good or service, less of that good or service will be produced and consumed. For example, a tax on cigarettes will raise the cost of smoking and reduce the amount of smoking that takes place. We can use a demand and supply graph to illustrate this point. Figure 4.11 shows the market for cigarettes.

Without the tax, the equilibrium price of cigarettes would be $6.00 per pack, and 4 billion packs of cigarettes would be sold per year (point *A*). If the federal government requires sellers of cigarettes to pay a $1.00-per-pack tax, then their cost of selling cigarettes will increase by $1.00 per pack. This increase in cost causes the supply curve for

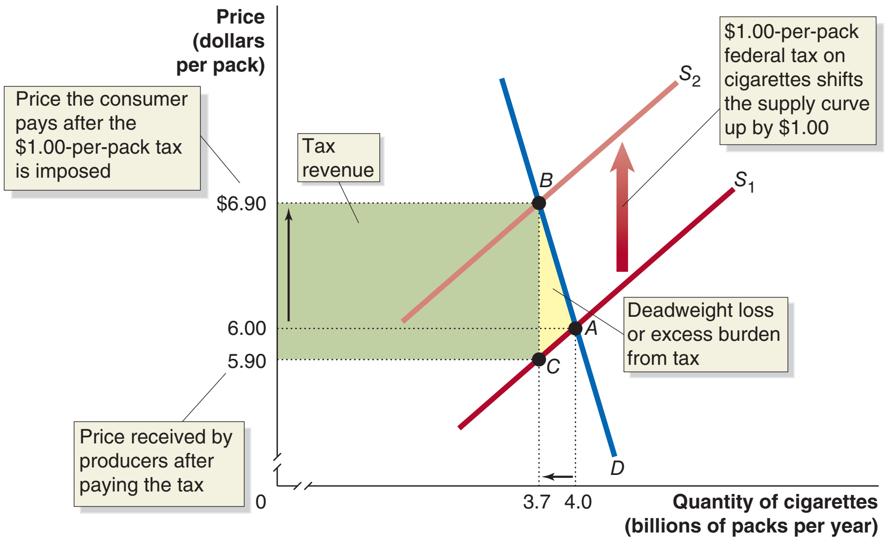


Figure 4.11

The Effect of a Tax on the Market for Cigarettes

Without the tax, market equilibrium occurs at point *A*. The equilibrium price of cigarettes is $6.00 per pack, and 4.0 billion packs of cigarettes are sold per year. A $1.00-per-pack tax on cigarettes will cause the supply curve for cigarettes to shift up by $1.00, from S_1 to S_2. The new equilibrium occurs at point *B*. The price of cigarettes will increase by $0.90, to $6.90 per pack, and the quantity sold will fall to 3.7 billion packs. The tax on cigarettes will increase the price paid by consumers from $6.00 to $6.90 per pack. Producers will receive a price of $6.90 per pack (point *B*), but after paying the $1.00 tax, they will be left with $5.90 (point *C*). The government will receive tax revenue equal to the green-shaded box. Some consumer surplus and some producer surplus will become tax revenue for the government, and some will become deadweight loss, shown by the yellow-shaded area.

cigarettes to shift up by $1.00 because sellers will now require a price that is $1.00 greater to supply the same quantity of cigarettes. In Figure 4.11, the supply curve shifts up by $1.00 to show the effect of the tax, and there is a new equilibrium price of $6.90 and a new equilibrium quantity of 3.7 billion packs (point *B*).

The federal government will collect tax revenue equal to the tax per pack multiplied by the number of packs sold, or $3.7 billion. The area shaded in green in Figure 4.11 represents the government's tax revenue. Consumers will pay a higher price of $6.90 per pack. Although sellers appear to be receiving a higher price per pack, once they have paid the tax, the price they receive falls from $6.00 per pack to $5.90 per pack. There is a loss of consumer surplus because consumers are paying a higher price. The price producers receive falls, so there is also a loss of producer surplus. Therefore, the tax on cigarettes has reduced *both* consumer surplus and producer surplus. Some of the reduction in consumer and producer surplus becomes tax revenue for the government. The rest of the reduction in consumer and producer surplus is equal to the deadweight loss from the tax, shown by the yellow-shaded triangle in the figure.

We can conclude that the true burden of a tax is not just the amount consumers and producers pay the government but also includes the deadweight loss. The deadweight loss from a tax is called the *excess burden* of the tax. *A tax is efficient if it imposes a small excess burden relative to the tax revenue it raises.* One contribution economists make to government tax policy is to advise policymakers on which taxes are most efficient.

Tax Incidence: Who Actually Pays a Tax?

The answer to the question "Who pays a tax?" seems obvious: Whoever is legally required to send a tax payment to the government pays the tax. But there can be an important difference between who is legally required to pay the tax and who actually *bears the burden* of the tax. Economists call the actual division of the burden of a tax between buyers and sellers **tax incidence**. For example, as of June 2023, the federal government levied an excise tax of 18.4 cents per gallon of gasoline sold. Gas station owners collect this tax and forward it to the federal government, but who actually bears the burden of the tax?

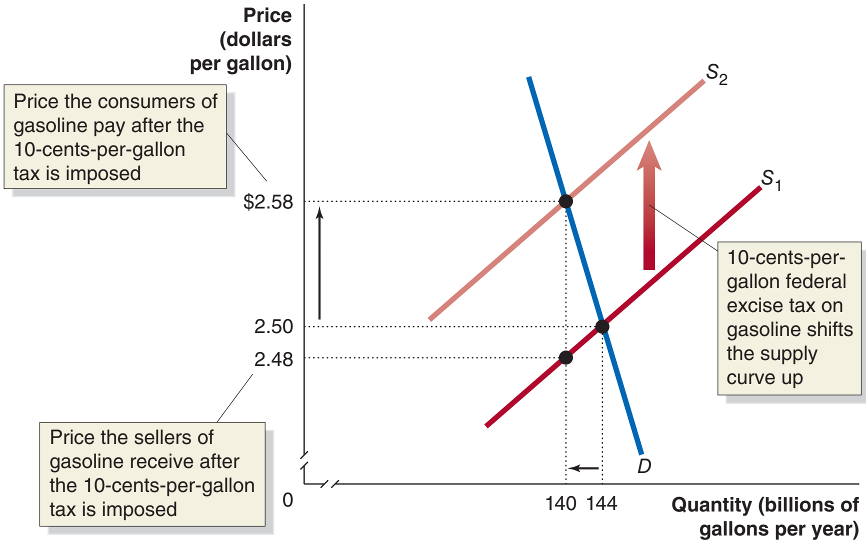
Tax incidence The actual division of the burden of a tax between buyers and sellers in a market.

Determining Tax Incidence on a Demand and Supply Graph Suppose that currently the federal government does not impose a tax on gasoline. In Figure 4.12, equilibrium in the retail market for gasoline occurs at the intersection of the demand curve and supply curve, S_1. The equilibrium price is $2.50 per gallon, and the equilibrium quantity is 144 billion gallons per year. Now suppose that the federal government imposes a 10-cents-per-gallon tax. As a result of the tax, the supply curve for gasoline will shift up by 10 cents per gallon. At the new equilibrium, where the demand curve intersects the supply curve, S_2, the price has risen by 8 cents per gallon, from $2.50 to

Figure 4.12

The Incidence of a Tax on Gasoline

With no tax on gasoline, the price would be \$2.50 per gallon, and 144 billion gallons of gasoline would be sold each year. A 10-cents-per-gallon excise tax shifts the supply curve up, from S_1 to S_2, raises the price consumers pay from \$2.50 to \$2.58, and lowers the price sellers receive from \$2.50 to \$2.48. Therefore, consumers pay 8 cents of the 10-cents-per-gallon tax on gasoline, and sellers pay 2 cents.



\$2.58. Notice that only in the extremely unlikely case that demand is a vertical line will the market price rise by the full amount of the tax. Consumers are paying 8 cents more per gallon. Sellers of gasoline receive a new higher price of \$2.58 per gallon, but after paying the 10-cents-per-gallon tax, they are left with \$2.48 per gallon, or 2 cents less than they were receiving in the old equilibrium.

Although the sellers of gasoline are responsible for collecting the tax and sending the tax receipts to the government, they do not bear most of the burden of the tax. In this case, consumers pay 8 cents of the tax because the market price has risen by 8 cents, and sellers pay 2 cents of the tax because after sending the tax to the government, they are receiving 2 cents less per gallon of gasoline sold. Expressed in percentage terms, consumers pay 80 percent of the tax, and sellers pay 20 percent of the tax.

Solved Problem 4.4

Who Bears the Burden of the Seattle Beverage Tax?

In 2018, the Seattle city council imposed a tax of 1.75 cents per ounce on sugar-sweetened beverages such as Coca-Cola, Kool-Aid, and Gatorade. Distributors who supply beverages to supermarkets and other stores pay the tax. A report prepared by Jesse Jones-Smith of the University of Washington and Nadine Chan of the Seattle Department of Public Health studied the incidence of the tax.

a. Would you expect distributors to bear the entire burden of the tax? That is, after paying the tax, will distributors be left with the previous price per ounce they were receiving from supermarkets minus the 1.75-cents-per-ounce tax? Briefly explain.

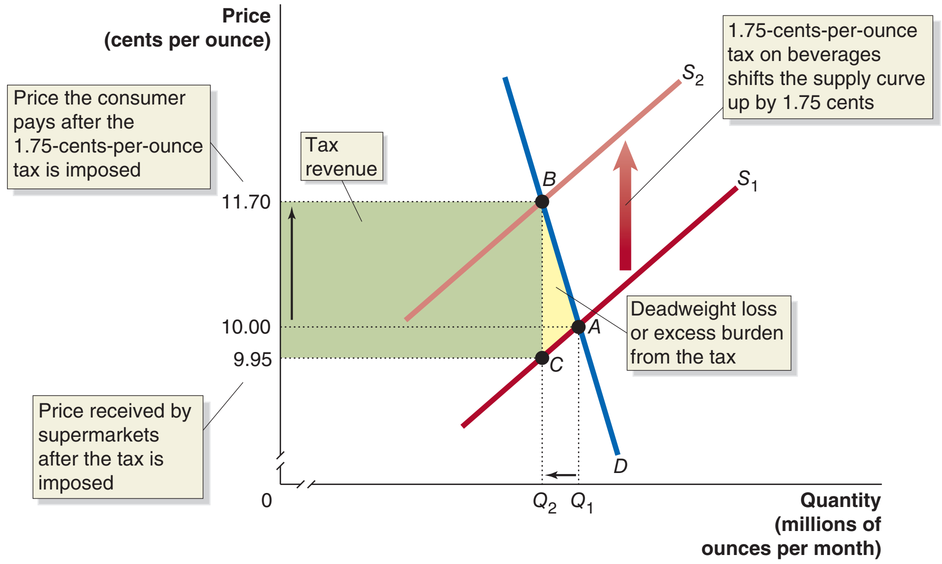
b. The study found that after the tax was imposed, the average price of sweetened beverages subject to the tax had risen by 1.70 cents per ounce in supermarkets and other stores. Suppose that before the tax was imposed, the average price of sugar-sweetened beverages was 10 cents per ounce. For simplicity, assume that supermarkets, rather than beverage distributors, are responsible for paying the tax to the city (or that distributors are able to increase the price they charge supermarkets by 1.75 cents per ounce, which amounts to the same thing). Use a graph of the market for sugar-sweetened beverages in supermarkets to show the effect of the tax. Be sure to explain what is happening in your graph and to include the area representing the amount of tax collected by Seattle and the deadweight loss from the tax. What percentage of the tax do consumers pay?

Solving the Problem

Step 1: Review the chapter material. This problem is about tax incidence, so you may want to review the section "Tax Incidence: Who Actually Pays a Tax?"

Step 2: Answer part (a) by explaining whether it is likely that beverage distributors will bear the entire burden of the tax. Beverage distributors are legally responsible for sending a tax of 1.75 cents for every ounce of sugar-sweetened beverages they sell to supermarkets or other stores. It's very likely that the distributors will increase the prices they charge supermarkets in order to shift the burden of the tax so they do not bear the entire burden. The closer distributors can come to increasing prices by 1.75 cents per ounce, the smaller their share of the burden of the tax will be.

Step 3: Start answering part (b) by drawing a graph like Figure 4.12 to illustrate the effect of the tax on the market for sugar-sweetened beverages in supermarkets.



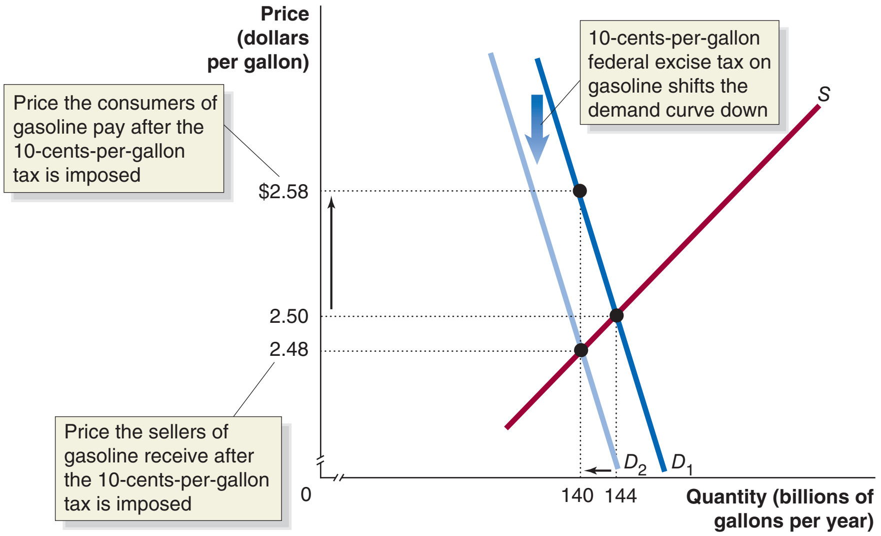
Step 4: Finish answering part (b) by explaining what is happening in your graph and by calculating the percentage of the tax paid by consumers. Without the tax, market equilibrium occurs at point *A*. The equilibrium price of beverages is 10 cents per ounce, and Q_1 ounces are sold per month. A 1.75-cents-per-ounce tax will cause the supply curve for beverages to shift up by 1.75 cents, from S_1 to S_2. The new equilibrium occurs at point *B*. The price of beverages will increase by 1.70 cents, to 11.70 cents per ounce, and the quantity sold will fall to Q_2. The tax will increase the price paid by consumers from 10.00 to 11.70 cents per ounce. Supermarkets will receive a price of 11.70 cents per ounce (point *B*), but after the tax, they will be left with 9.95 cents per ounce (point *C*). The government will receive tax revenue equal to the green-shaded box. Some consumer surplus and some producer surplus will become tax revenue for the government, and some will become deadweight loss. Because the price increases by 1.70 cents per ounce, consumers pay $(1.70/1.75) \times 100 = 97\%$ of the tax.

Your Turn: For more practice, do related problem 4.8 at the end of the chapter.

Does It Make a Difference Whether the Government Collects a Tax from Buyers or Sellers? We have already seen the important distinction between who is legally required to pay a tax and who actually bears the burden of a tax. We can reinforce this point by noting explicitly that the incidence of a tax does *not* depend on whether the government collects a tax from the buyers of a good or from the sellers. Figure 4.13 illustrates this point by showing the effect on equilibrium in the market for gasoline if a 10-cents-per-gallon tax is imposed on buyers rather than on sellers. That is, we are now assuming that instead of sellers having to collect the 10-cents-per-gallon tax at the pump, buyers are responsible for keeping track of how many gallons of gasoline they purchase and sending the tax to the government. (Of course, it would be very difficult for buyers to keep track of their purchases or for the government to check whether they were paying all of the taxes they owe. That is why the government collects the tax on gasoline from sellers.)

Figure 4.13 is similar to Figure 4.12 except that it shows the gasoline tax being imposed on buyers rather than on sellers. In Figure 4.13, the supply curve does not shift because nothing has happened to change the quantity of gasoline that sellers are willing to supply at any given price. The demand curve has shifted, however, because consumers now have to pay a 10-cent tax on every gallon of gasoline they buy. Therefore, at every quantity, they are willing to pay a price 10 cents lower than they would have paid without the tax. In the figure, we indicate the effect of the tax by shifting the demand curve down by 10 cents, from D_1 to D_2. Once the tax has been imposed and the demand curve has shifted down, the new equilibrium quantity of gasoline is 140 billion gallons, which is exactly the same as in Figure 4.12.

The new equilibrium price after the tax is imposed appears to be different in Figure 4.13 than in Figure 4.12, but if we include the tax, buyers will pay the same price, and sellers will receive the same price in both figures. To see this point, notice that in Figure 4.12, consumers pay sellers a price of $2.58 per gallon. In Figure 4.13, consumers pay sellers only $2.48, but they must also pay the government a tax of 10 cents per gallon. So, the total price consumers pay remains $2.58 per gallon. In Figure 4.12, sellers receive $2.58 per gallon from consumers, but after they pay the tax of 10 cents per gallon, they are left with $2.48, which is the same amount they receive in Figure 4.12.



Price the consumers of gasoline pay after the 10-cents-per-gallon tax is imposed

10-cents-per-gallon federal excise tax on gasoline shifts the demand curve down

Price the sellers of gasoline receive after the 10-cents-per-gallon tax is imposed

Figure 4.13

The Incidence of a Tax on Gasoline Paid by Buyers

With no tax on gasoline, the demand curve is D_1. If the government imposes a 10-cents-per-gallon tax that consumers are responsible for paying, the demand curve shifts down by the amount of the tax, from D_1 to D_2. In the new equilibrium, consumers pay a price of $2.58 per gallon, including the tax. Producers receive $2.48 per gallon. The result is the same as when producers are responsible for paying the tax.

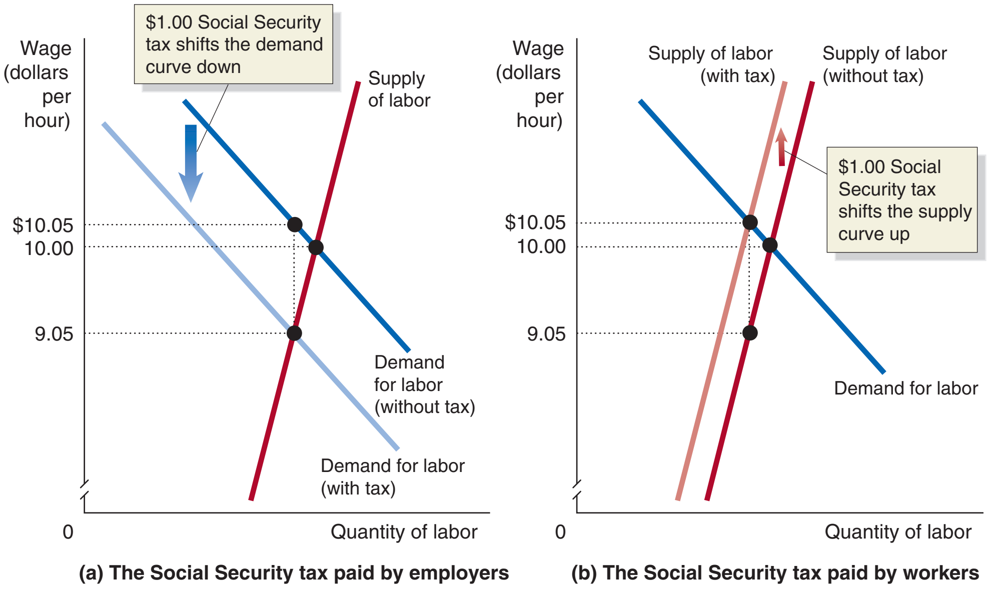
Apply the Concept

Is the Burden of the Social Security Tax Really Shared Equally between Workers and Firms?

Most people who receive paychecks have several different taxes withheld by their employers, who forward the taxes directly to the government. In fact, after getting their first job, many people are shocked when they discover the gap between their gross pay and their net pay after taxes have been deducted. The largest tax many people of low or moderate income pay is FICA, which stands for the Federal Insurance Contributions Act. FICA funds the Social Security and Medicare programs, which provide income and health care to older people and people who have disabilities. FICA is sometimes called the *payroll tax*. When Congress passed the act, it wanted employers and workers to equally share the burden of the tax. In 2023, FICA was 15.3 percent of wages, with workers paying 7.65 percent, which is withheld from their paychecks, and employers paying the other 7.65 percent.

But does requiring workers and employers to each pay half the tax mean that the burden of the tax is also shared equally? Our discussion in this chapter shows that the answer is "no." In the labor market, employers are buyers, and workers are sellers. As we saw in the example of the federal tax on gasoline, whether the tax is collected from buyers or from sellers does not affect the incidence of the tax. Most economists believe, in fact, that the burden of FICA falls almost entirely on workers. The following figure, which shows the market for labor, illustrates why.

In the market for labor, the demand curve represents the quantity of labor demanded by employers at various wages, and the supply curve represents the quantity of labor supplied by workers at various wages. The intersection of the demand curve and the supply curve determines the equilibrium wage. In both panels, the equilibrium wage without a Social Security payroll tax is $10 per hour. For simplicity, let's assume that the payroll tax equals $1 per hour of work. In panel (a), we assume that employers must pay the tax. The tax causes the demand for labor curve to shift down by $1 at every quantity of labor because firms must now pay a $1 tax for every hour of labor they hire. We have drawn the supply curve for labor as being very steep because most economists believe the quantity of labor supplied by workers does not change much as the wage rate changes. In panel (a), after the tax is imposed, the equilibrium wage declines from $10 per hour to $9.05 per hour. Firms are now paying a total of $10.05 for every hour of work they hire: $9.05 in wages to workers and $1 in tax to the government. In other words, workers have paid $0.95 of the $1 tax, and firms have paid only $0.05.



Panel (b) shows that this result is exactly the same when the tax is imposed on workers rather than on firms. In this case, the tax causes the supply curve for labor to shift up by $1 at every quantity of labor because workers must now pay a tax of $1 for every hour they work. After the tax is imposed, the equilibrium wage increases to $10.05 per hour. But workers receive only $9.05 after they have paid the $1.00 tax. Once again, workers have paid $0.95 of the $1 tax, and firms have paid only $0.05.

Although the figure presents a simplified analysis, it reflects the conclusion of most economists who have studied the incidence of FICA: Even though Congress requires employers to pay half the tax and workers to pay the other half, in fact, the burden of the tax falls almost entirely on workers. This conclusion would not be changed even if Congress revised the law to require either employers or workers to pay all of the tax. The forces of demand and supply working in the labor market, and not Congress, determine the incidence of the tax.

Your Turn: Test your understanding by doing related problems 4.9 and 4.10 at the end of this chapter.

Continued from chapter opener

Economics in Your Life & Career

As a Member of the City Council, Should You Support Rent Control?

At the beginning of the chapter, we posed the following questions: If you and the other city council members vote to enact a rent control law, is it likely that in the future it will be easier for renters to find an affordable apartment in your city? Who in your city would benefit, and who would lose from this law?

This chapter has shown that although rent control can keep rents lower than they might otherwise be, it can also lead to a permanent shortage of apartments. Renters may have to search for a long time to find a suitable apartment, and landlords may even ask renters to make additional payments, in violation of the rent control law, which would make the actual rent paid higher than the controlled rent. Finding an apartment in a city after enactment of rent control will typically be more difficult. People who are able to find an apartment at the controlled rent will benefit if the city council enacts the law, while landlords who abide by the rent control law and renters who are unable to find an apartment at the controlled rent will lose. As the chapter also notes, whether rent control should be enacted is a normative question—one that you and the rest of the city council will have to answer.

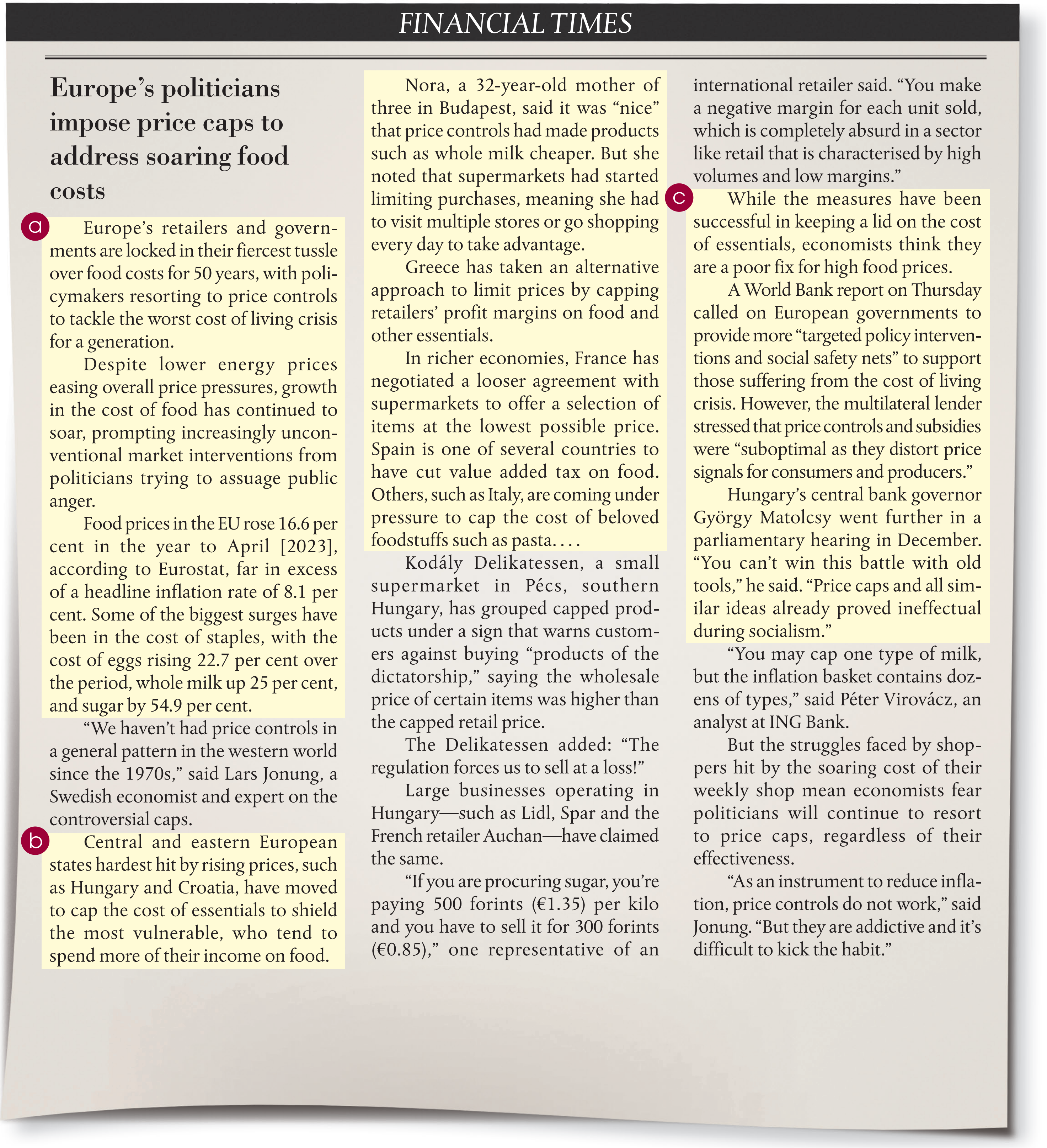
Conclusion

Our discussion of the model of demand and supply shows that markets free from government intervention eliminate surpluses and shortages and do a good job of responding to the wants of consumers. We have seen that both consumers and firms sometimes try to use the government to change market outcomes in their favor. The concepts of consumer surplus, producer surplus, and deadweight loss allow us to measure the benefits consumers and producers receive from competitive market equilibrium. These concepts also allow us to measure the effects of government price floors and price ceilings and the economic effect of taxes.

Read *An Inside Look* on the next page for a discussion of the inefficiencies that result when governments impose price ceilings to try to control rapidly rising food prices.

AN INSIDE LOOK

European Governments React to Rising Food Prices



FINANCIAL TIMES

Europe's politicians impose price caps to address soaring food costs

ⓐ Europe's retailers and governments are locked in their fiercest tussle over food costs for 50 years, with policymakers resorting to price controls to tackle the worst cost of living crisis for a generation.

Despite lower energy prices easing overall price pressures, growth in the cost of food has continued to soar, prompting increasingly unconventional market interventions from politicians trying to assuage public anger.

Food prices in the EU rose 16.6 per cent in the year to April [2023], according to Eurostat, far in excess of a headline inflation rate of 8.1 per cent. Some of the biggest surges have been in the cost of staples, with the cost of eggs rising 22.7 per cent over the period, whole milk up 25 per cent, and sugar by 54.9 per cent.

"We haven't had price controls in a general pattern in the western world since the 1970s," said Lars Jonung, a Swedish economist and expert on the controversial caps.

ⓑ Central and eastern European states hardest hit by rising prices, such as Hungary and Croatia, have moved to cap the cost of essentials to shield the most vulnerable, who tend to spend more of their income on food.

Nora, a 32-year-old mother of three in Budapest, said it was "nice" that price controls had made products such as whole milk cheaper. But she noted that supermarkets had started limiting purchases, meaning she had to visit multiple stores or go shopping every day to take advantage.

Greece has taken an alternative approach to limit prices by capping retailers' profit margins on food and other essentials.

In richer economies, France has negotiated a looser agreement with supermarkets to offer a selection of items at the lowest possible price. Spain is one of several countries to have cut value added tax on food. Others, such as Italy, are coming under pressure to cap the cost of beloved foodstuffs such as pasta. . . .

Kodály Delikatessen, a small supermarket in Pécs, southern Hungary, has grouped capped products under a sign that warns customers against buying "products of the dictatorship," saying the wholesale price of certain items was higher than the capped retail price.

The Delikatessen added: "The regulation forces us to sell at a loss!"

Large businesses operating in Hungary—such as Lidl, Spar and the French retailer Auchan—have claimed the same.

"If you are procuring sugar, you're paying 500 forints (€1.35) per kilo and you have to sell it for 300 forints (€0.85)," one representative of an international retailer said. "You make a negative margin for each unit sold, which is completely absurd in a sector like retail that is characterised by high volumes and low margins."

ⓒ While the measures have been successful in keeping a lid on the cost of essentials, economists think they are a poor fix for high food prices.

A World Bank report on Thursday called on European governments to provide more "targeted policy interventions and social safety nets" to support those suffering from the cost of living crisis. However, the multilateral lender stressed that price controls and subsidies were "suboptimal as they distort price signals for consumers and producers."

Hungary's central bank governor György Matolcsy went further in a parliamentary hearing in December. "You can't win this battle with old tools," he said. "Price caps and all similar ideas already proved ineffectual during socialism."

"You may cap one type of milk, but the inflation basket contains dozens of types," said Péter Virovácz, an analyst at ING Bank.

But the struggles faced by shoppers hit by the soaring cost of their weekly shop mean economists fear politicians will continue to resort to price caps, regardless of their effectiveness.

"As an instrument to reduce inflation, price controls do not work," said Jonung. "But they are addictive and it's difficult to kick the habit."

Key Points in the Article

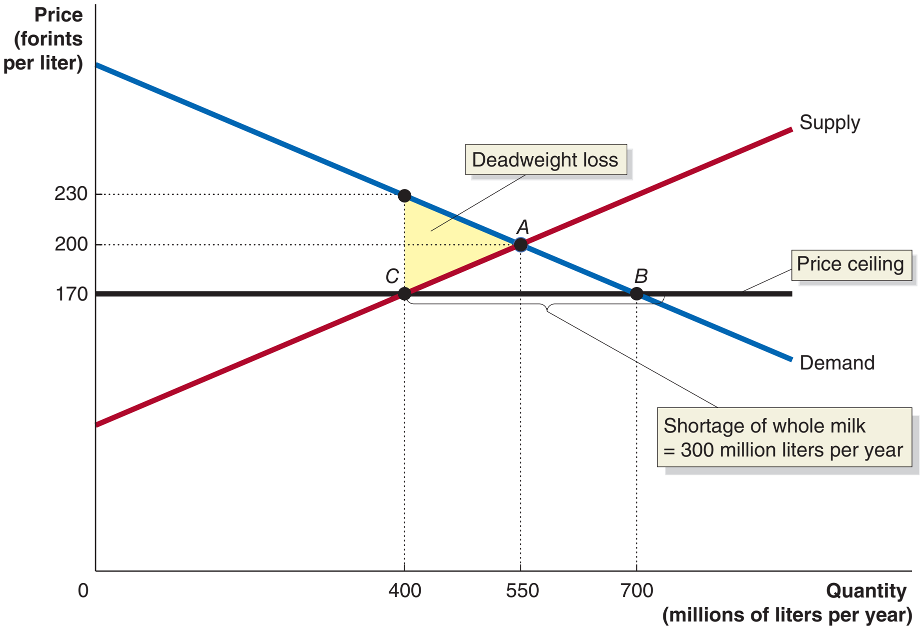
Rapidly rising food prices in Europe sparked public anger in 2023. A number of European governments responded by enacting price controls in an effort to make essential products more affordable for consumers. By implementing programs ranging from price ceilings and profit caps to value-added tax cuts, governments intervened in food markets to an extent that had not been seen since the 1970s. While these price controls have helped prevent prices from continuing to rise, they have also created inefficiencies in the market. A World Bank report emphasized that price controls are not an optimal way of dealing with rising prices, and the governor of Hungary's central bank informed the country's parliament that price caps didn't work in the past and should not be tried again now.

Analyzing the News

ⓐ Government price controls reduce economic efficiency by setting prices at levels that are different from competitive equilibrium. These controlled prices can benefit some people while harming others. Price ceilings are legally determined maximum prices that sellers may charge. Some governments in Europe are implementing price ceilings on food products. These price ceilings are designed to help consumers by lowering prices, but price ceilings harm sellers who are legally required to sell products below competitive equilibrium prices and consumers who are unable to buy the products because of shortages caused by the price ceilings.

ⓑ European governments have approached the high food prices in different ways. For example, Greece has capped retailers' profits, France has negotiated prices with supermarkets, Spain has cut its value-added tax, and Hungary and Croatia have enacted price ceilings on essential products.

The forint is the currency of Hungary. The figure below shows a hypothetical example of the market for whole milk in that country. The competitive equilibrium price for whole milk is 200 forints per liter. At this price, 550 million liters per year are purchased (point *A*). If the Hungarian government sets a price ceiling of 170 forints per liter, consumers can afford to buy more whole milk, and the quantity demanded increases from 550 million liters per year to 700 million liters (point *B*). At the ceiling price of 170 forints per liter, however, sellers provide less whole milk, and the quantity supplied decreases from 550 million liters to 400 million liters (point *C*). This change in the quantity supplied results in a shortage of 300 million liters per year and generates a deadweight loss equal to the area of the yellow triangle. The figure illustrates that while some consumers pay less for whole milk, there is less product available for them to purchase.



The market for whole milk before and after the imposition of a government-mandated price ceiling of 170 forints per liter. The price ceiling results in a shortage of 300 million liters per year and a deadweight loss.

ⓒ The price controls implemented in Europe have helped make food more affordable for some consumers, but when governments interfere with market-determined prices, they create both winners and losers. With price ceilings, the government-established prices help some consumers afford more products. However, price ceilings also result in product shortages, which leave some consumers unable to buy products. In other words, even though some consumers pay lower prices, they may not be able to purchase the quantity they desire, and some consumers may be unable to buy the product at all. Price ceilings also harm sellers by reducing their profits—potentially forcing some firms to close. With price controls, markets typically become less efficient, deadweight losses occur, and economic surplus is reduced.

Thinking Critically

1. Explain why a government-imposed price ceiling on whole milk could create an illegal market for whole milk with a price not only higher than the legal maximum price but also higher than the original competitive equilibrium price. Redraw the graph and explain the price that would be charged in this illegal market. On the graph, show the areas representing the producer surplus and consumer surplus that are transferred to the illegal market sellers.
2. The article mentions that Spain cut the value-added tax on food to help lower the price to consumers. The value-added tax is a consumption tax. Draw two graphs, the first showing the market for whole milk before the value-added tax is lowered and the second showing the market after the value-added tax is lowered. Explain what happens to price and quantity after the tax cut and on both graphs show the areas representing the deadweight loss and tax revenue. (*Hint:* Review Chapter 4, Section 4.4.)

CHAPTER SUMMARY AND PROBLEMS

Key Terms

Consumer surplus, p. 112
Deadweight loss, p. 119
Economic efficiency, p. 120
Economic surplus, p. 118
Illegal market, p. 126
Marginal benefit, p. 112
Marginal cost, p. 116
Price ceiling, p. 112
Price floor, p. 112
Producer surplus, p. 116
Tax incidence, p. 131

4.1 Consumer Surplus and Producer Surplus

LEARNING OBJECTIVE: Distinguish between the concepts of consumer surplus and producer surplus.

Summary

Although most prices are determined by demand and supply in markets, the government sometimes imposes *price ceilings* and *price floors*. A **price ceiling** is a legally determined maximum price that sellers may charge. A **price floor** is a legally determined minimum price that sellers may receive. Economists analyze the effects of price ceilings and price floors by using the concepts of *consumer surplus, producer surplus,* and *deadweight loss*. **Marginal benefit** is the additional benefit to a consumer from consuming one more unit of a good or service. The demand curve is also a marginal benefit curve. **Consumer surplus** is the difference between the highest price a consumer is willing to pay for a good or service and the actual price the consumer pays. The total amount of consumer surplus in a market is equal to the area below the demand curve and above the market price. **Marginal cost** is the change in a firm's total cost from producing one more unit of a good or service. The supply curve is also a marginal cost curve. **Producer surplus** is the difference between the lowest price a firm is willing to accept for a good or service and the price it actually receives. The total amount of producer surplus in a market is equal to the area above the supply curve and below the market price.

Review Questions

1.1 What is marginal benefit? Why is the demand curve referred to as a marginal benefit curve?

1.2 What is marginal cost? Why is the supply curve referred to as a marginal cost curve?

1.3 What is consumer surplus? How does consumer surplus change as the equilibrium price of a good rises or falls?

1.4 What is producer surplus? How does producer surplus change as the equilibrium price of a good rises or falls?

Problems and Applications

1.5 On a shopping trip, Sofia decided to buy a light blue coat that had a price tag of $79.95. When she brought the coat to the store's sales clerk, the clerk told Sofia that the coat was on sale, and she would pay 20 percent less than the price on the tag. After the discount was applied, Sofia paid $63.96, $15.99 less than the original price. Was the value of Sofia's consumer surplus from this purchase $79.95? $63.96? $15.99? Or some other amount? Briefly explain.

1.6 Economist Tim Harford wrote in a column for the *Financial Times* that "new digital goods have a huge and unmeasured benefit to consumers—'consumer surplus.'" Briefly explain what he meant. Is a product's price the best measure of the product's benefit to consumers (that is, the higher the price, the larger the benefit)?

1.7 An article in the *Wall Street Journal* explained that an increase in demand that began during the Covid–19 pandemic prompted Bacardi Ltd. and Campari to produce more expensive brands of rum. Bacardi sells a brand of rum aged for a minimum of 16 years for $100 per bottle. In 2021, Campari began selling a brand of rum aged for 37 years for $1,100 per bottle.

- **a.** Molly buys a bottle of Bacardi rum for $100. Mitchell buys a bottle of Campari rum for $1,100. Explain how Molly may have received more consumer surplus for her purchase than Mitchell received from his. Explain how Mitchell may have received more consumer surplus for his purchase than Molly received from hers.
- **b.** The article mentioned that because of an increase in consumer demand, rum producers "hope to benefit from drinkers' willingness to pay up for pricier booze." Describe the difference between an increase in a consumer's willingness to pay for a bottle of rum and an increase in consumer surplus from the purchase of a bottle of rum.
- **c.** Assume that Mitchell received $300 of consumer surplus when he paid $1,100 for a bottle of Campari rum aged for 37 years. What was the maximum price Mitchell was willing to pay for the rum?

1.8 Erik Brynjolfsson of Stanford, Avinash Gannamaneni of MIT, and Felix Eggers of the University of Groningen estimated that the average U.S. consumer over age 16 would pay $1,173 per year rather than do without Netflix. At the time of the study, Netflix had about 59 million subscribers in the United States and charged an average of $11 per month. If the economists' estimate is accurate, how much consumer surplus do Netflix viewers receive?

1.9 **[Related to the Chapter Opener]** Uber is a service people use to arrange transportation with drivers who use their own cars for this purpose. Customers pay for their rides with the Uber smartphone app. Uber's prices fluctuate with the demand for the service. This "surge pricing" can result in different prices for the same distance traveled at different times of day or days of the week. Annie Lowrey, a writer for the *New York Times*, explained that she paid $13 for a 10 P.M. 2-mile trip in downtown Washington, DC, on New Year's Eve. Three hours later she paid $47 for the return trip to her home. Did she receive negative consumer surplus on her return trip? Briefly explain.

1.10 Consider the information given in the following table on four consumers in the market for premium bottled water.

Consumer	Highest Price Willing to Pay
Jill	$4
Jose	3
Josh	2
Jordan	1

a. If the price of a bottle of premium bottled water is \$1.50, what is the total consumer surplus received by these consumers? Illustrate your answer with a graph.

b. Suppose the price of premium bottled water rises to \$2.50. Now what is the consumer surplus received by these consumers? Illustrate your answer by using the graph you prepared in part (a).

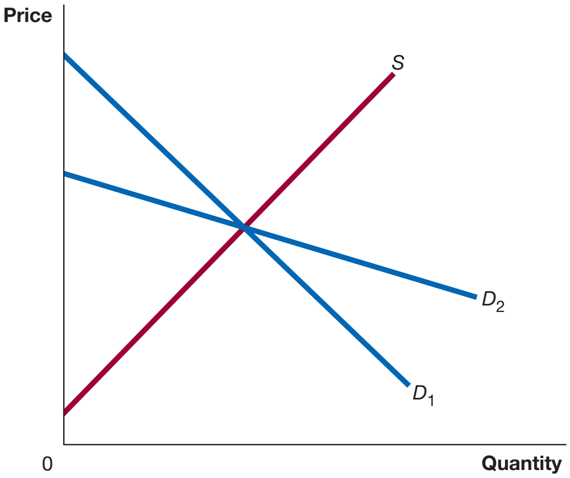
1.11 Suppose that a frost in Florida reduces the size of the orange crop, which causes the supply curve for oranges to shift to the left. Briefly explain whether consumer surplus will increase or decrease and whether producer surplus will increase or decrease. Use a demand and supply graph to illustrate your answers.

1.12 Amazon has been a pioneer in developing cashierless technology in retail stores. In Amazon Go supermarkets, sensors detect which products shoppers have put in their baskets and charge the shoppers' credit cards as they leave the store. Eliminating checkout lines significantly reduces the cost of operating these supermarkets.

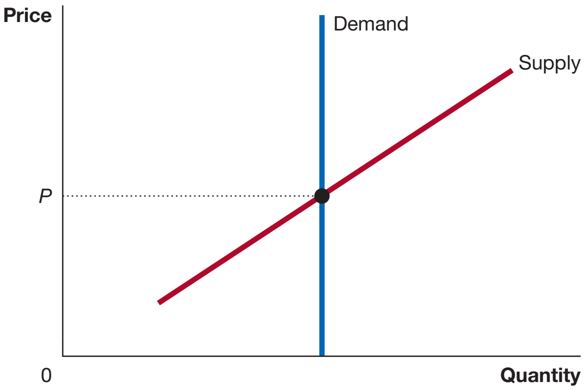
a. Assume that eventually all supermarkets use cashierless technology. Use a demand and supply graph of the market for groceries to show the effect of these falling costs on consumer surplus in this market.

b. Can we be certain whether these falling costs will increase producer surplus? Briefly explain.

1.13 In the following graph, is the consumer surplus larger with demand curve D_1 or demand curve D_2? Briefly explain. Compare the producer surplus with demand curve D_1 and with demand curve D_2.

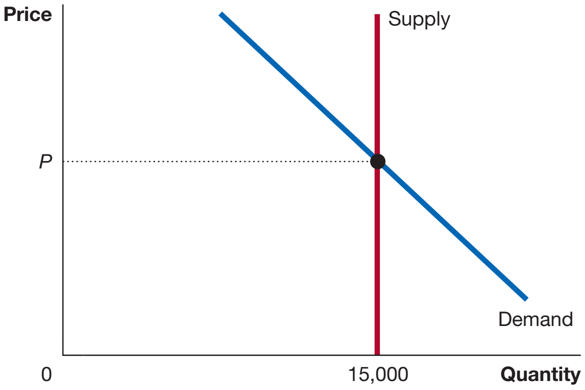


1.14 Assume that the following graph illustrates the market for a breast cancer–fighting drug, without which breast cancer patients cannot survive. What is the consumer surplus in this market? How does it differ from the consumer surplus in the markets you have studied up to this point?



1.15 **[Related to the Apply the Concept "The Consumer Surplus from Uber"]** The *Apply the Concept* states that the value of the area representing consumer surplus from Uber's service was \$2.88 billion per year for the four cities involved in the study. Use the information from the graph in the *Apply the Concept* to show how this value was calculated. (For a review of how to calculate the area of a triangle, see the appendix to Chapter 1.)

1.16 The following graph shows the market for tickets to a concert that will be held in a local arena that seats 15,000 people. What is the producer surplus in this market? How does it differ from the producer surplus in the markets you have studied up to this point?



4.2 The Efficiency of Competitive Markets

LEARNING OBJECTIVE: Explain the concept of economic efficiency.

Summary

Equilibrium in a competitive market is economically efficient. **Economic surplus** is the sum of consumer surplus and producer surplus. **Economic efficiency** is a market outcome in which the marginal benefit to consumers from the last unit produced is equal to the marginal cost of production and in which the sum of consumer surplus and producer surplus is at a maximum. When the market price is above or below the equilibrium price, there is a reduction in economic surplus. The reduction in economic surplus resulting from a market not being in competitive equilibrium is called the **deadweight loss**.

Review Questions

2.1 Define *economic surplus* and *deadweight loss*. Some economists call economic surplus *social surplus*. Briefly explain why this label might be appropriate.

2.2 What is economic efficiency? Why do economists define efficiency in this way?

Problems and Applications

2.3 In 2022, according to the U.S. Department of Agriculture, California, Texas, Oregon, Nevada, Utah, and New Mexico were suffering from extreme drought. The lack of rainfall greatly reduced the growth of grass that ranchers use to feed cattle. The result was a reduction in the number of cattle raised in these states. Use a demand and supply graph of the cattle market to illustrate the effect of the drought. How are producer surplus and consumer surplus affected? Briefly explain.

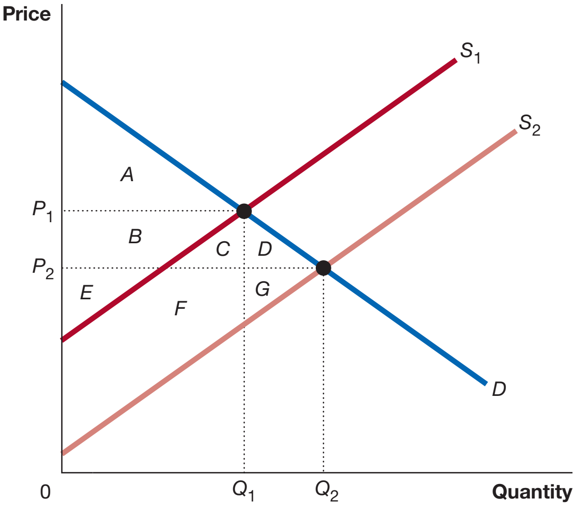
2.4 Briefly explain whether you agree with the following statement: "A lower price in a market always increases economic efficiency in that market."

2.5 Briefly explain whether you agree with the following statement: "If, at the current quantity, marginal benefit is greater than marginal cost, there will be a deadweight loss in the market. However, there is no deadweight loss when marginal cost is greater than marginal benefit."

2.6 According to an article in the *Wall Street Journal*, more restaurants have begun to use only eggs from chickens that are raised without cages—meaning that the chickens are not confined to conventional hen houses. The cost of producing eggs this way is higher than the cost of producing them using conventional methods. Suppose that consumers react to the news of restaurants using only cage-free eggs by increasing their demand for omelets. Can you tell whether economic surplus will increase in the market for omelets? Use a graph of the market for omelets to illustrate your answer.

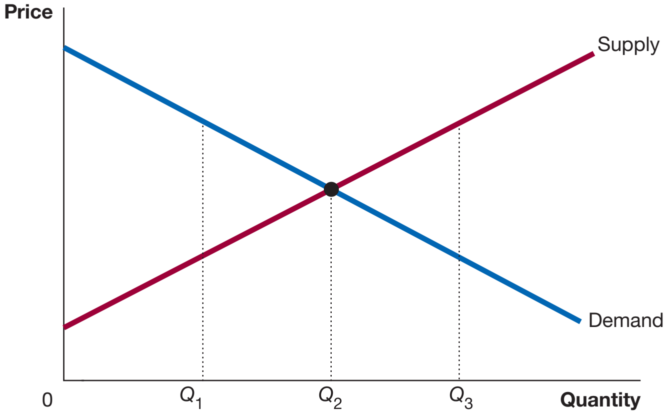
2.7 Briefly explain whether you agree with the following statement: "If consumer surplus in a market increases, producer surplus must decrease."

2.8 Using the following graph, show the effects on consumer surplus and producer surplus of an increase in supply from S_1 to S_2. By how much does economic surplus increase?



2.9 A student argues: "Economic surplus is greatest at the level of output where the difference between marginal benefit and marginal cost is largest." Do you agree? Briefly explain.

2.10 Using the following graph, explain why economic surplus would be smaller if Q_1 or Q_3 were the quantity produced than if Q_2 is the quantity produced.



4.3 Government Intervention in the Market: Price Floors and Price Ceilings

LEARNING OBJECTIVE: Explain the economic effect of government-imposed price floors and price ceilings.

Summary

Producers or consumers who are dissatisfied with the equilibrium in a market can attempt to convince the government to impose a price floor or a price ceiling. Price floors usually increase producer surplus, decrease consumer surplus, and cause a deadweight loss. Price ceilings usually increase consumer surplus, reduce producer surplus, and cause a deadweight loss. The results of the government imposing price ceilings and price floors are that some people win, some people lose, and a loss of economic efficiency occurs.

Price ceilings and price floors can lead to an **illegal market**, in which buying and selling take place at prices that violate government price regulations. Positive analysis is concerned with *what is*, and normative analysis is concerned with *what should be*. Positive analysis shows that price ceilings and price floors cause deadweight losses. Whether these policies are desirable or undesirable, though, is a normative question.

Review Questions

3.1 Why do some consumers tend to favor price ceilings while others tend to oppose them?

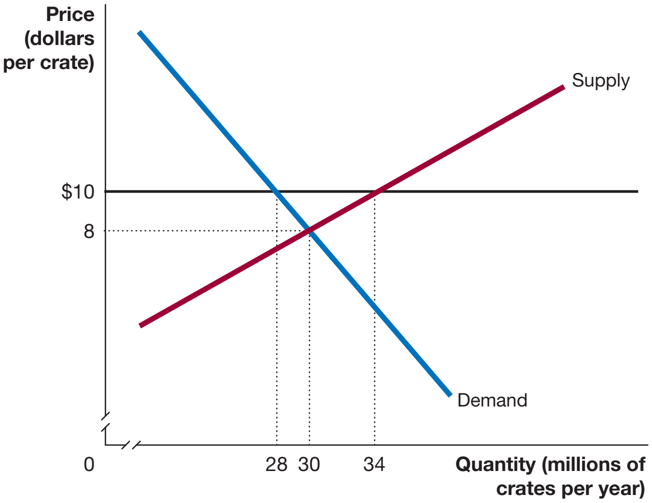
3.2 Do producers tend to favor price floors or price ceilings? Briefly explain.

3.3 What is an illegal market? Under what circumstances do illegal markets arise?

3.4 Can economic analysis provide a final answer to the question of whether the government should intervene in markets by imposing price ceilings and price floors? Briefly explain.

Problems and Applications

3.5 The following graph shows the market for apples. Assume that the government has imposed a price floor of $10 per crate.



a. How many crates of apples will be sold to consumers after the price floor has been imposed?

b. Will there be a shortage or a surplus of apples? If there is a shortage or a surplus, how large will it be?

c. Will apple producers benefit from the price floor? If so, explain how they will benefit.

3.6 Use the information on the kumquat market in the table to answer the following questions.

Price (per crate)	Quantity Demanded (millions of crates per year)	Quantity Supplied (millions of crates per year)
$10	120	20
15	110	60
20	100	100
25	90	140
30	80	180
35	70	220

a. What are the equilibrium price and quantity? How much revenue do kumquat producers receive when the market is in equilibrium? Draw a graph showing the market equilibrium and the area representing the revenue kumquat producers receive.

b. Suppose the federal government decides to impose a price floor of $30 per crate. Now how many crates of kumquats will consumers purchase? How much revenue will kumquat producers receive? Assume that the government does not purchase any surplus kumquats. On your graph from part (a), show the price floor, the change in the quantity of kumquats purchased, and the revenue kumquat producers receive after the price floor is imposed.

c. Suppose the government imposes a price floor of $30 per crate and purchases any surplus kumquats from producers. Now, how much revenue will kumquat producers receive? How much will the government spend on purchasing surplus kumquats? On your graph from part (a), show the area representing the amount the government spends to purchase the surplus kumquats.

3.7 In 2022, large increases in rent led lawmakers across the United States to consider enacting rent control laws in their states and cities. An article in the *Wall Street Journal* quoted Stijn Van Nieuwerburgh as saying: "Rents are exploding at a pace far faster than income. The problem is now as bad as it has ever been. And probably much worse."

a. Draw and label a graph that depicts a demand curve and a supply curve in the market for apartments in Middletown. Assume that the market was in equilibrium in 2020 and the equilibrium rent at that time was $750 per month.

b. Refer to the graph you drew in part (a) to describe how an increase in demand would increase the equilibrium rent in Middletown to $1,200 per month.

c. Assume that the Middletown city council passes a law that limits apartment rents to $750 per month. Use your graph to explain why the law will cause a shortage of apartments in Middletown.

d. Because of the shortage of apartments, those who are not able to rent an apartment in Middletown for $750 per month will be forced to find an apartment in nearby Centertown, which has no rent control law. Draw and label a graph that depicts a demand curve and a supply curve for apartments in Centertown. Refer to your graph to describe the effect on the equilibrium rent and quantity of apartments in Centertown as a result of the rent control law in Middletown.

3.8 Suppose that the government sets a price floor for milk that is above the competitive equilibrium price and that the government does not purchase any surplus milk.

a. Draw a graph showing this situation. Be sure your graph shows the competitive equilibrium price, the price floor, the quantity that would be sold in competitive equilibrium, and the quantity that would be sold with the price floor.

b. Compare the economic surplus in this market when there is a price floor and when there is not.

3.9 Ekaterina Jardim and colleagues at the University of Washington concluded that when Seattle raised its minimum wage, the effect was to lower "the amount paid to workers in low-wage jobs by an average of $74 per month per job in 2016."

a. Shouldn't an increase in the minimum wage raise, rather than lower, the amount paid to low-wage workers? Briefly explain.

b. Does this result mean that no low-wage workers in Seattle benefited from the increase in the minimum wage? Briefly explain.

c. What effect might this result have on a *normative* analysis of the minimum wage?

3.10 **[Related to the Apply the Concept "What Do Natural Experiments Tell Us about the Effects of the Minimum Wage?"]** David Card of the University of California, Berkeley, Joshua Angrist of the Massachusetts Institute of Technology, and Guido Imbens of Stanford University shared the 2021 Nobel Prize in Economics for pioneering the use of natural experiments to estimate economic relationships.

a. What is a causal relationship in economics? Give two examples of relationships between economic variables that might be causal.

b. What problems can arise when economists attempt to statistically estimate a causal relationship?

c. What are natural experiments? How can natural experiments help to overcome problems with measuring causal relationships?

d. Suppose California increases its minimum wage to $20 per hour during a period when Iowa leaves its minimum wage unchanged. You attempt to measure the effect of an increase in the minimum wage on employment by comparing the change in employment among warehouse workers in California following the increase in the state's minimum wage with the change in employment during the same period among workers in fast-food restaurants in Iowa. Are your estimates of the effect of the minimum wage likely to be accurate? Briefly explain. (*Hint:* Compare your approach with the approach used by David Card and Alan Krueger, as described in the *Apply the Concept*.)

3.11 **[Related to the Chapter Opener]** Cities like San Francisco and New York that require a driver to buy a city-issued taxi medallion before the driver can legally operate a taxi are shifting the supply curve for taxis to the left relative to where it would be without the requirement for a medallion.

a. Briefly explain why the supply curve for taxi rides shifts to the left. What is the effect on the market price of taxi rides from the medallion requirement?

b. A news article made the following two points: (1) In 2010, medallions in San Francisco were selling for $250,000, and (2) no medallions were sold between 2016 and 2021. Why would taxi medallions have been worth $250,000 in 2010? Why was it apparently impossible to sell them at any price between 2016 and 2021?

3.12 **[Related to the Economics in Your Life & Career]** The competitive equilibrium rent in the city of Lowell is currently $1,000 per month. The government decides to enact rent control and establish a price ceiling of $750 per month for apartments. Briefly explain whether rent control is likely to make each of the following people better or worse off.

a. Someone currently renting an apartment in Lowell

b. Someone who will be moving to Lowell next year and who intends to rent an apartment

c. A landlord who intends to abide by the rent control law

d. A landlord who intends to ignore the law and illegally charge the highest rent possible for his apartments

3.13 **[Related to the Don't Let This Happen to You]** Briefly explain whether you agree with the following statement: "If there is a shortage of a good, the good must be scarce, but there is not a shortage of every scarce good."

3.14 **[Related to Solved Problem 4.3]** Use the information on the market for apartments in Bay City in the table to answer the following questions.

Rent	Quantity Demanded	Quantity Supplied
$500	375,000	225,000
600	350,000	250,000
700	325,000	275,000
800	300,000	300,000
900	275,000	325,000
1,000	250,000	350,000

a. In the absence of rent control, what is the equilibrium rent, and what is the equilibrium quantity of apartments rented? Draw a demand and supply graph of the market for apartments to illustrate your answer. In equilibrium, will there be any renters who are unable to find an apartment to rent or any landlords who are unable to find a renter for an apartment?

b. Suppose the government sets a ceiling of $600 per month on rents. What is the quantity of apartments demanded, and what is the quantity of apartments supplied?

c. Assume that all landlords abide by the law in part (b). Use a demand and supply graph to illustrate the effect of this price ceiling on the market for apartments. Be sure to indicate on your graph each of the following: (i) the area representing consumer surplus after the price ceiling has been imposed, (ii) the area representing producer surplus after the price ceiling has been imposed, and (iii) the area representing the deadweight loss after the price ceiling has been imposed.

d. Assume that the quantity of apartments supplied is the same as you determined in (b), but now assume that landlords ignore the law and rent this quantity of apartments for the highest rent they can get. Briefly explain what this rent will be.

3.15 **[Related to the Apply the Concept "Should the Government Limit 'Price Gouging' during an Emergency?"]** Many state laws against price gouging apply only during emergencies.

a. Why might state governments decide that the laws should apply only during emergencies rather than at all times?

b. What protects consumers from price gouging during times that aren't emergencies?

3.16 A student makes the following argument: "A price floor reduces the amount of a product that consumers buy because it keeps the price above the competitive market equilibrium. A price ceiling, though, increases the amount of a product that consumers buy because it keeps the price below the competitive market equilibrium." Do you agree with the student's reasoning? Use a demand and supply graph to illustrate your answer.

3.17 University towns with major football programs experience an increase in demand for hotel rooms during home football weekends. Hotels respond to the increase in demand by increasing the prices they charge for rooms. Periodically, there is an outcry against the higher prices, accompanied by accusations of "price gouging."

a. Draw a demand and supply graph of the market for hotel rooms in Boostertown for weekends with home football games and another graph for weekends without home football games. If the Boostertown city council passes a law stating that prices for rooms are not allowed to rise, what will happen to the market for hotel rooms during home football game weekends? Show your answer on your graph.

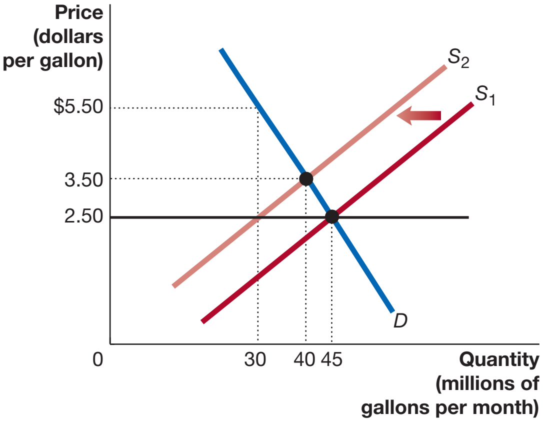
b. If the prices of hotel rooms are not allowed to increase, what will be the effect on out-of-town football fans?

c. How might the city council's law affect the supply of hotel rooms over time? Briefly explain.

d. University towns are not the only places that face peak and nonpeak "seasons." Can you think of other locations that face a large increase in demand for hotel rooms during particular times of the year? Why do we typically not see laws limiting the prices hotels can charge during peak seasons?

3.18 A columnist writing for crainsnewyork.com observes that "the central conclusion of the vast majority of economic work on the subject is that rent regulation leads to a deterioration of housing stock." What does the columnist mean by "deterioration of housing stock"? Why might rent control result in this outcome?

3.19 Suppose that initially the gasoline market is in equilibrium, at a price of \$2.50 per gallon and a quantity of 45 million gallons per month. Then a war in the Middle East disrupts imports of oil into the United States, shifting the supply curve for gasoline from S_1 to S_2. The price of gasoline begins to rise, and consumers protest. The federal government responds by setting a price ceiling of \$2.50 per gallon. Use the graph to answer the following questions.



a. If there were no price ceiling, what would be the equilibrium price of gasoline, the quantity of gasoline demanded, and the quantity of gasoline supplied? Now assume that the price ceiling is imposed and that there is no illegal market in gasoline. What are the price of gasoline, the quantity of gasoline demanded, and the quantity of gasoline supplied? How large is the shortage of gasoline?

b. Assume that the price ceiling is imposed, and there is no illegal market in gasoline. Show on the graph the areas representing consumer surplus, producer surplus, and deadweight loss.

c. Now assume that there is an illegal market, and the price of gasoline rises to the maximum that consumers are willing to pay for the amount supplied by producers at \$2.50 per gallon. Show on the graph the areas representing producer surplus, consumer surplus, and deadweight loss.

d. Are consumers better off with the price ceiling than without it? Briefly explain.

3.20 A news article on economist.com in late 2022 noted that the decision by the Venezuelan government to "relax price controls" has resulted in somewhat "better times." Briefly explain why relaxing price controls might lead to an increase in goods and services produced in Venezuela.

4.4 The Economic Effect of Taxes

LEARNING OBJECTIVE: Analyze the economic effect of taxes.

Summary

Most taxes result in a loss of consumer surplus, a loss of producer surplus, and a deadweight loss. The true burden of a tax is not just the amount consumers and producers pay to the government but also includes the deadweight loss. The deadweight loss from a tax is called the excess burden of the tax. **Tax incidence** is the actual division of the burden of a tax. In most cases, consumers and firms share the burden of a tax levied on a good or service.

Review Questions

4.1 What is meant by *tax incidence*?

4.2 What do economists mean by an *efficient tax*?

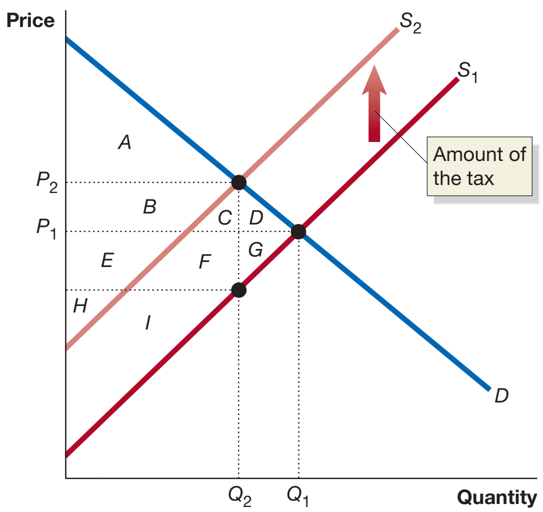
4.3 Does who is legally responsible for paying a tax—buyers or sellers—make a difference in the amount of tax each pays? Briefly explain.

4.4 As explained in the chapter, economic efficiency is a market outcome in which the marginal benefit to consumers of the last unit produced is equal to its marginal cost of production. Using this explanation of economic efficiency, explain why a tax creates a deadweight loss.

Problems and Applications

4.5 Suppose that the current equilibrium price of a quarter-pound hamburger is \$5, and 10 million quarter-pound hamburgers are sold per month. After the federal government imposes a tax of \$0.50 per hamburger, the equilibrium price of hamburgers rises to \$5.20, and the equilibrium quantity falls to 9 million. Illustrate this situation with a demand and supply graph. Be sure your graph shows the equilibrium price before and after the tax; the equilibrium quantity before and after the tax; and the areas representing consumer surplus after the tax, producer surplus after the tax, tax revenue collected by the government, and deadweight loss.

4.6 The following graph shows the effect of a tax imposed on soft drinks. Use this graph to answer the questions.

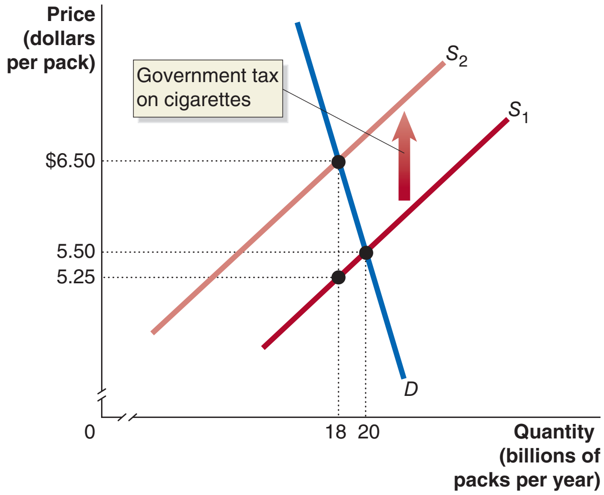


a. Which areas in the graph represent the excess burden (deadweight loss) of the tax?

b. Which areas represent the revenues collected by the government from the tax?

c. Would economists consider this tax to be efficient? Briefly explain.

4.7 Use the following graph of the market for cigarettes to answer the questions.



a. According to the graph, how much is the government tax on cigarettes?

b. What price do producers receive after paying the tax?

c. How much tax revenue does the government collect?

d. How would the graph be different if the tax were collected from the buyers of cigarettes?

e. If the tax were collected from buyers, what would be the new equilibrium price that buyers pay producers of cigarettes?

f. Including the tax, what would be the total amount that cigarette buyers pay per pack?

4.8 **[Related to Solved Problem 4.4]** Suppose the federal government decides to impose a sales tax of $1.00 per pizza. Briefly explain whether you agree with the following statement, made by a representative of the pizza industry:

> The pizza industry is very competitive. As a result, pizza sellers will have to pay the whole tax because they are unable to pass any of it on to consumers in the form of higher prices. Therefore, a sales tax of $1.00 per pizza will result in pizza sellers receiving $1.00 less on each pizza sold, after paying the tax.

Illustrate your answer with a graph showing the effect of the tax on the market for pizza.

4.9 **[Related to the Apply the Concept "Is the Burden of the Social Security Tax Really Shared Equally between Workers and Firms?"]** The city of Philadelphia imposes a 10 percent tax on sales of liquor in the city. According to the city's website, the liquor tax "is technically paid by retail customers at the point of sale. However, the seller is responsible for filing and paying the tax on a monthly basis."

a. What does the following statement from the city website mean: "[the liquor tax] is technically paid by retail customers at the point of sale"? Are the prices that customers pay for liquor 10 percent higher than they would be if there were no tax? Briefly explain.

b. If customers, rather than sellers, were legally responsible for filing and paying the tax with the city, would it change the price that customers pay for liquor or the price sellers receive (minus the amount of the tax)? Briefly explain. (Ignore potential problems the city might have in actually collecting the tax if customers were required to file and pay it.)

4.10 **[Related to the Apply the Concept "Is the Burden of the Social Security Tax Really Shared Equally between Workers and Firms?"]** Suppose the government imposes a payroll tax of $1 per hour of work and collects the tax from employers. Use a graph for the market for labor to show the effect of the payroll tax, assuming the special case of a vertical supply curve of labor. By how much does the new equilibrium wage that employers pay workers fall?

Critical Thinking Exercises

CT4.1 For this exercise, your instructor may assign you to a group. The chapter describes how a market can be economically efficient. Before you took this class, you might have heard someone say that "markets are efficient." Compare the description of efficiency in this chapter with what you thought about efficiency prior to taking this class. Write up your thoughts in a paragraph, which your instructor may ask you to turn in or discuss in class. In your group, each member should make the comparison. Then, as a group, prepare a one-paragraph summary of what you discussed and be prepared to turn in the summary or discuss it with the class.

CT4.2 Suppose that the state of New York abolished rent control. A friend of yours who lives there complains about the higher apartment rents that result. This friend has never taken an economics class. Explain to your friend why the apartment market is now more efficient because rent control was abolished. Your explanation should be two paragraphs long and contain a visual, such as a graph or table, that illustrates your argument. Include in your answer a brief discussion of whether you think your analysis is likely to affect your friend's opinion of rent control.

CT4.3 In the spring of 2020, at the beginning of the Covid–19 pandemic, farmers who sold their output to restaurants and to firms that purchase farm output from farmers and then sell the output to restaurants destroyed crops and dumped milk. From this information, can we tell whether the market for supplying food to restaurants was in equilibrium?

Appendix

LEARNING OBJECTIVE: Use quantitative demand and supply analysis.

Quantitative Demand and Supply Analysis

Graphs help us understand economic change *qualitatively*. For instance, a demand and supply graph can tell us that if household incomes rise, the demand curve for a normal good will shift to the right, and the price of the good will rise. Often, though, economists, business managers, and policymakers want to know more than the qualitative direction of change; they want a *quantitative estimate* of the size of the change.

In this chapter, we carried out a qualitative analysis of rent controls. We saw that imposing rent controls involves a trade-off: Renters as a group gain, but landlords lose, and the market for apartments becomes less efficient, as shown by the deadweight loss. To better evaluate rent controls, we need to know more than just that these gains and losses exist; we need to know how large they are. A quantitative analysis of rent controls will tell us how large the gains and losses are.

Demand and Supply Equations

The first step in a quantitative analysis is to supplement our use of demand and supply curves with demand and supply *equations*. Economists use data on prices, quantities, and other economic variables to statistically estimate equations for demand and supply curves. For example, suppose that economists have estimated that the demand for apartments in New York City is:

$$Q^D = 4{,}750{,}000 - 1{,}000P,$$

and the supply of apartments is:

$$Q^S = -1{,}000{,}000 + 1{,}300P.$$

We have used Q^D for the quantity of apartments demanded per month, Q^S for the quantity of apartments supplied per month, and P for the apartment rent, in dollars per month. In reality, both the quantity of apartments demanded and the quantity of apartments supplied will depend on more than just the rental price of apartments in New York City. The demand for apartments in New York City will also depend, for instance, on the average incomes of families in the New York area and on the rents of apartments in the surrounding cities. For simplicity, we will ignore these other factors.

With no government intervention, we know that at competitive market equilibrium, the quantity demanded must equal the quantity supplied, or:

$$Q^D = Q^S.$$

We can use this equation, which is called an *equilibrium condition*, to solve for the equilibrium monthly apartment rent by setting the quantity demanded from the demand equation equal to the quantity supplied from the supply equation:

$$\begin{aligned} 4{,}750{,}000 - 1{,}000P &= -1{,}000{,}000 + 1{,}300P \\ 5{,}750{,}000 &= 2{,}300P \\ P = \frac{5{,}750{,}000}{2{,}300} &= \$2{,}500. \end{aligned}$$

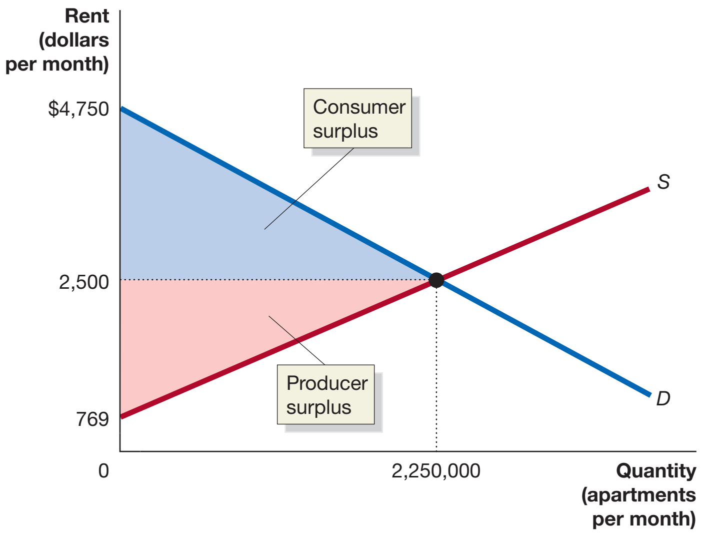


Figure 4A.1

Graphing Demand and Supply Equations

After statistically estimating demand and supply equations, we can use the equations to draw demand and supply curves. In this case, the equilibrium rent for apartments is $2,500 per month, and the equilibrium quantity of apartments rented is 2,250,000. The demand equation tells us that at a rent of $4,750, the quantity of apartments demanded will be zero. The supply equation tells us that at a rent of $769, the quantity of apartments supplied will be zero. The areas representing consumer surplus and producer surplus are also indicated on the graph.

We can then substitute this price back into either the supply equation or the demand equation to find the equilibrium quantity of apartments rented:

$$Q^D = 4{,}750{,}000 - 1{,}000P = 4{,}750{,}000 - 1{,}000(2{,}500) = 2{,}250{,}000,$$

or:

$$Q^S = -1{,}000{,}000 + 1{,}300P = -1{,}000{,}000 + 1{,}300(2{,}500) = 2{,}250{,}000.$$

Figure 4A.1 illustrates the information from these equations in a graph. The figure shows the values for rent when both the quantity supplied and the quantity demanded are zero. These values can be calculated from the demand and supply equations by setting Q^D and Q^S equal to zero and solving for price:

$$Q^D = 0 = 4{,}750{,}000 - 1{,}000P$$

$$P = \frac{4{,}750{,}000}{1{,}000} = \$4{,}750$$

and:

$$Q^S = 0 = -1{,}000{,}000 + 1{,}300P$$

$$P = \frac{-1{,}000{,}000}{-1{,}300} = \$769.23.$$

Calculating Consumer Surplus and Producer Surplus

Figure 4A.1 shows consumer surplus and producer surplus in the market for rental apartments. Recall that the sum of consumer surplus and producer surplus equals the net benefit that renters and landlords receive from participating in the market for apartments.

We can use the values from the demand and supply equations to calculate the value of consumer surplus and producer surplus. Remember that consumer surplus is the area below the demand curve and above the line representing market price. Notice that this area forms a right triangle because the demand curve is a straight line: It is *linear*. As we noted in the appendix to Chapter 1, the area of a triangle is equal to ½ × Base × Height. In this case, the area is:

$$\frac{1}{2} \times (2{,}250{,}000) \times (4{,}750 - 2{,}500) = \$2{,}531{,}250{,}000.$$

So, this calculation tells us that the consumer surplus in the market for rental apartments in New York City is about $2.5 billion per month.

We can calculate producer surplus in a similar way. Remember that producer surplus is the area above the supply curve and below the line representing market price. Because the supply curve is also a straight line, producer surplus in the figure is equal to the area of the triangle:

$$\frac{1}{2} \times 2,250,000 \times (2,500 - 769) = \$1,947,375,000.$$

This calculation tells us that the producer surplus in the market for rental apartments in New York City is about $1.9 billion per month.

We can use the same type of analysis to measure the effect of rent control on consumer surplus, producer surplus, and economic efficiency. For instance, suppose the city imposes a rent ceiling of $1,500 per month. Figure 4A.2 can help guide us as we measure the effect.

First, we can calculate the quantity of apartments that will actually be rented by substituting the rent ceiling of $1,500 into the supply equation:

$$Q^S = -1,000,000 + (1,300 \times 1,500) = 950,000.$$

We also need to know the price on the demand curve when the quantity of apartments is 950,000. We can do this by substituting 950,000 for quantity in the demand equation and solving for price:

$$\begin{aligned} 950,000 &= 4,750,000 - 1,000P \\ P &= \frac{-3,8000,000}{-1,000} = \$3,800. \end{aligned}$$

Compared with its value in competitive equilibrium, consumer surplus has been reduced by a value equal to the area of triangle *B* but increased by a value equal to the area of rectangle *A*. The area of triangle *B* is:

$$\frac{1}{2} \times (2,250,000 - 950,000) \times (3,800 - 2,500) = \$845,000,000,$$

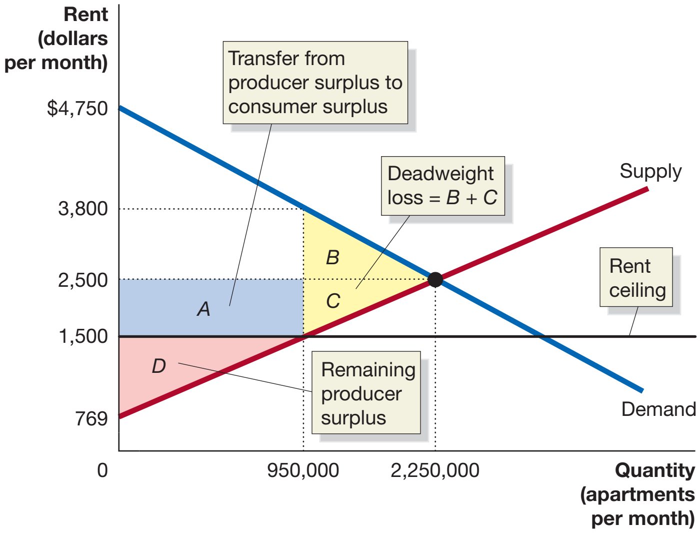


Figure 4A.2

Calculating the Economic Effect of Rent Controls

Once we have estimated equations for the demand and supply of rental housing, a graph can guide our numerical estimates of the economic effects of rent control. Consumer surplus falls by an amount equal to the area of triangle *B* and increases by an amount equal to the area of rectangle *A*. Producer surplus falls by an amount equal to the sum of the areas of rectangle *A* and triangle *C*. The remaining producer surplus is equal to the area of triangle *D*. Deadweight loss is equal to the sum of the areas of triangles *B* and *C*.

and the area of rectangle *A* is Base × Height, or:

$$(\$2{,}500 - \$1{,}500) \times (950{,}000) = \$950{,}000{,}000.$$

The value of consumer surplus in competitive equilibrium was $2,531,250,000. As a result of the rent ceiling, it will be increased to:

$$(\$2{,}531{,}250{,}000 + 950{,}000{,}000) - \$845{,}000{,}000 = \$2{,}636{,}250{,}000.$$

Compared with its value in competitive equilibrium, producer surplus has been reduced by a value equal to the sum of the areas of triangle *C* and rectangle *A*. The area of triangle *C* is:

$$\frac{1}{2} \times (2{,}250{,}000 - 950{,}000) \times (2{,}500 - 1{,}500) = \$650{,}000{,}000.$$

We have already calculated the area of rectangle *A* as $950,000,000. The value of producer surplus in competitive equilibrium was $1,947,375,000. As a result of the rent ceiling, it will be reduced to:

$$\$1{,}947{,}375{,}000 - \$650{,}000{,}000 - \$950{,}000{,}000 = \$347{,}375{,}000.$$

The loss of economic efficiency, as measured by the deadweight loss, is equal to the value represented by the areas of triangles *B* and *C*, or:

$$\$845{,}000{,}000 + \$650{,}000{,}000 = \$1{,}495{,}000{,}000.$$

The following table summarizes the results of the analysis (with values in millions of dollars):

Consumer Surplus		Producer Surplus		Deadweight Loss	
Competitive Equilibrium	Rent Control	Competitive Equilibrium	Rent Control	Competitive Equilibrium	Rent Control
$2,531	$2,636	$1,947	$347	$0	$1,495

Qualitatively, we know that imposing rent control will make consumers better off, make landlords worse off, and decrease economic efficiency. The advantage of the analysis we have just gone through is that it puts dollar values on the qualitative results. We can now see how much consumers have gained, how much landlords have lost, and how great the decline in economic efficiency has been. Sometimes the quantitative results can be surprising. Notice, for instance, that after the imposition of rent control, the deadweight loss is actually much greater than the remaining producer surplus. Of course, these results are dependent on the numbers we chose for the demand and supply curve equations. Choosing different numbers would have changed the results.

Economists often study issues where the qualitative results of actions are apparent—even to non-economists. You don't have to be an economist to understand who wins and who loses from rent control or that if a company cuts the price of its product, its sales will increase. Business managers, policymakers, and the general public do, however, need economists to measure quantitatively the effects of different actions—including policies such as rent control—so that they can better assess the results of those actions.

4A Quantitative Demand and Supply Analysis

LEARNING OBJECTIVE: Use quantitative demand and supply analysis.

Review Questions

4A.1 In a linear demand equation, what economic information is conveyed by the intercept on the price axis? Similarly, what economic information is conveyed by the intercept on the price axis in a linear supply equation?

4A.2 Suppose you were assigned the task of choosing a price that maximizes economic surplus in a market. What price would you choose? Why?

4A.3 Consumer surplus is used as a measure of a consumer's net benefit from purchasing a good or service. Explain why consumer surplus is a measure of net benefit.

4A.4 Why would economists use the term *deadweight loss* to describe the effect on consumer surplus and producer surplus from a price control?

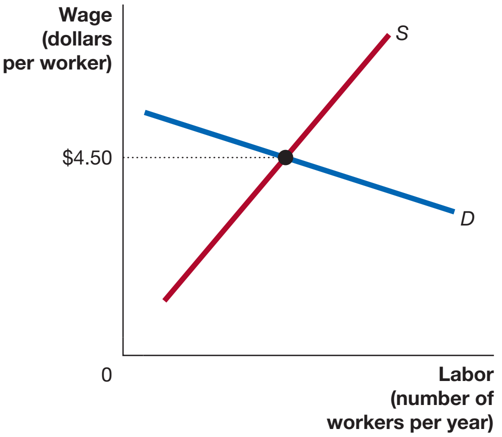
Problems and Applications

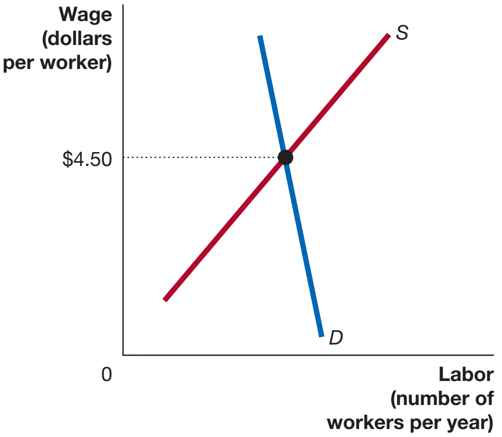
4A.5 Suppose that you have been hired to analyze the effect on employment from the imposition of a minimum wage in the labor market. Further suppose that you estimate the demand and supply functions for labor, where L stands for the quantity of labor (measured in thousands of workers) and W stands for the wage rate (measured in dollars per hour):

$$\text{Demand: } L^D = 100 - 4W$$
$$\text{Supply: } L^S = 6W.$$

First, calculate the free market equilibrium wage and quantity of labor. Now suppose the proposed minimum wage is $12. How large will the surplus of labor in this market be?

4A.6 The following graphs illustrate the markets for two different types of labor. Suppose that an identical minimum wage is imposed in both markets. Briefly explain in which market the minimum wage will have the largest effect on employment.



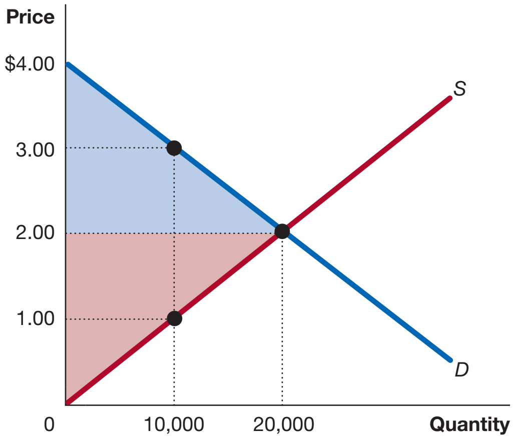


4A.7 Suppose that you are the vice president of operations for a manufacturing firm that sells an industrial lubricant in a competitive market. Further suppose that your economist gives you the following demand and supply functions:

$$\text{Demand: } Q^D = 45 - 2P$$
$$\text{Supply: } Q^S = -15 + P.$$

What is the consumer surplus in this market? What is the producer surplus?

4A.8 The following graph shows a market in which a price floor of $3.00 per unit has been imposed. Calculate the values of each of the following.



a. The deadweight loss

b. The transfer of producer surplus to consumers or the transfer of consumer surplus to producers

c. Producer surplus after the price floor is imposed

d. Consumer surplus after the price floor is imposed

4A.9 Construct a table like the one in this appendix but assume that the rent ceiling is $2,000 rather than $1,500.

5 Externalities, Environmental Policy, and Public Goods

NextEra Energy Faces Challenges in Converting to Green Power

Unlimited low-cost clean energy. That was the promise in late 2022, when researchers at Lawrence Livermore National Laboratory in California became the first to achieve a controlled *nuclear fusion* reaction. Unlike the *fission* reactions that occur in conventional nuclear power plants, nuclear fusion produces more energy than it consumes. Nuclear fusion provides clean energy in that it doesn't produce carbon dioxide, CO_2, a *greenhouse gas* that most scientists believe contributes to global warming. It will likely be years, though, before power plants using nuclear fusion become available.

Traditionally, the United States has generated power by relying on massive deposits of coal. Electricity generated from burning coal powered the steel, locomotive, textile, and automobile factories that propelled the United States to the highest standard of living in the world. But burning coal also produces carbon dioxide. As people have become more concerned about climate change, coal's role in generating electricity has declined sharply. In 2022, U.S. utilities used coal to generate only a quarter of their output of electricity, down from half in 2000. During the same period, the share of renewables, such as solar, wind, and hydropower, that utilities used in generating electricity increased from 8 percent to 16 percent. The decline in the price of natural gas has helped increase its share of electricity generation from 9 percent to 37 percent.

You probably haven't heard of James Robo, but he has played a key role in helping the United States transition from using fossil fuels to generate electricity to using renewables. Robo is the CEO of NextEra Energy, which produces more electricity using solar and wind power than any other company in the world and has the highest stock market value of any U.S. power company. NextEra's success has depended on three key factors: (1) federal and state governments offering subsidies for using renewable energy, (2) state governments requiring that renewables account for an increasing fraction of electricity generation, and (3) declining prices for renewable energy equipment such as wind turbines.

Caia Image/Collection Mix: Subjects/Getty Images

Policies such as requiring utilities to generate power from renewables and requiring that automobile companies produce cars with better gas mileage are examples of environmental *command-and-control policies*. Although these policies are popular with the general public and with politicians, many economists favor *market-based policies* that rely on economic incentives rather than on administrative rules to reduce greenhouse gases.

A carbon tax, under which the federal government would tax energy consumption on the basis of the carbon content of the energy, is an example of a market-based policy that provides households and firms with an economic incentive to reduce their use of fossil fuels such as coal and gasoline by raising their prices. The carbon tax has been controversial, however. Some businesses oppose the carbon tax because they believe it will raise their costs of production. Other businesses view the carbon tax favorably, particularly in comparison with command-and-control policies that they view as more costly and less effective. Some members of Congress have proposed a "Green New Deal," which would rely primarily on command-and-control methods to eliminate carbon emissions in power generation within 10 years.

As we will see in this chapter, economic analysis plays an important role in the debate over environmental policies.

Chapter Outline & Learning Objectives

5.1 **Externalities and Economic Efficiency,** page 156
Identify examples of positive and negative externalities and use graphs to show how externalities affect economic efficiency.

5.2 **Private Solutions to Externalities: The Coase Theorem,** page 159
Discuss the Coase theorem and explain how private bargaining can lead to economic efficiency in a market with an externality.

5.3 **Government Policies to Deal with Externalities,** page 165
Analyze government policies to achieve economic efficiency in a market with an externality.

5.4 **Four Categories of Goods,** page 175
Categorize goods on the basis of whether they are rival or excludable and use graphs to illustrate the efficient quantities of public goods and common resources.

Economics in Your Life & Career

Advising a Senator about the "Best" Level of Pollution

Policymakers debate alternative approaches for achieving the goal of reducing carbon dioxide emissions. Suppose you take a job in Washington, DC, as a policy aide to a U.S. senator. The senator asks you, "If carbon dioxide emissions hurt the environment, should the federal government take action to eliminate them *completely*?" How do you respond? As you read this chapter, try to answer this question. You can check your answer against the one we provide at the end of this chapter.

Pollution is a part of economic life. Consumers create air pollution by burning gasoline to power their cars and natural gas to heat their homes. Firms create air pollution when they produce electricity, pesticides, and plastics. Utilities such as electric power plants produce sulfur dioxide when they burn coal to generate electricity. Sulfur dioxide contributes to acid rain, which can damage trees, crops, and buildings. The burning of fossil fuels generates carbon dioxide and other greenhouse gases that can increase global warming.

Externality A benefit or cost that affects someone who is not directly involved in the production or consumption of a good or service.

Pollution is an example of an **externality**, which is a benefit or cost that affects someone who is not directly involved in the production or consumption of a good or service. In the case of air pollution, there is a *negative externality* because, for example, people with asthma may bear a cost even though they were not involved in the buying or selling of the electricity that caused the pollution. In the case of medical research, there is a *positive externality* because people who are not directly involved in producing medical research or paying for it can benefit.

A competitive market usually does a good job of producing the economically efficient quantity of a good or service—except when there is an externality in the market. When there is a *negative externality*, the market may produce a quantity of the good that is greater than the efficient amount. When there is a *positive externality*, the market may produce a quantity that is less than the efficient amount. Government interventions in the economy—such as the price floors on agricultural products or price ceilings on rents we discussed in Chapter 4, Section 4.3—can reduce economic efficiency. But, when there are externalities, government intervention may *increase* economic efficiency and enhance the well-being of society. Economists can help policymakers ensure that government programs are as efficient as possible.

In this chapter, we explore how best to deal with the problems resulting from pollution and other externalities. In the discussion of global warming, we examine carbon emissions for various countries and policy proposals including a carbon tax and a Green New Deal. We also look at *public goods*, such as national defense, which may not be produced at all unless the government produces them.

5.1 Externalities and Economic Efficiency

LEARNING OBJECTIVE: Identify examples of positive and negative externalities and use graphs to show how externalities affect economic efficiency.

When you consume a Big Mac, only you benefit, but when you consume a college education, other people also benefit. College-educated people can make those they work with more productive, are less likely to commit crimes, and, by being better-informed voters, are more likely to support economically efficient government policies. So, although you capture most of the benefits of your college education, you do not capture all of them.

When you buy a Big Mac, the price you pay covers all of the cost McDonald's incurs in producing the Big Mac. When you buy electricity from a utility that burns coal and generates carbon dioxide, though, the price you pay covers some of the costs the utility incurs but does not cover the cost of the damage carbon dioxide does to the environment.

Externalities can be positive or negative:

- There is a *positive externality* in the production of college educations because people who do not pay for them will nonetheless benefit from them.
- There is a *negative externality* in the generation of electricity. For example, if fish and wildlife have disappeared from a lake because of acid rain generated by a utility, people who live near the lake incur a cost—even though they may not purchase electricity from that utility.

The Effect of Externalities

Externalities interfere with the *economic efficiency* of a market equilibrium. A competitive market achieves economic efficiency by maximizing the sum of consumer surplus and producer surplus (see Chapter 4, Section 4.2). *But that result holds only if there are no externalities in production or consumption.* An externality can cause a difference between the *private cost* of production and the *social cost*:

- The **private cost** is the cost borne by the producer of a good or service.
- The **social cost** is the total cost of producing a good or service, and it is equal to the private cost plus any external cost, such as the cost of pollution.

Unless there is an externality, the private cost and the social cost are equal.

An externality can also cause a difference between the *private benefit* from consumption and the *social benefit*:

- The **private benefit** is the benefit received by the consumer of a good or service.
- The **social benefit** is the total benefit from consuming a good or service, and it is equal to the private benefit plus any external benefit, such as the benefit to others resulting from your college education.

Unless there is an externality, the private benefit and the social benefit are equal.

Private cost The cost borne by the producer of a good or service.

Social cost The total cost of producing a good or service, including both the private cost and any external cost.

Private benefit The benefit received by the consumer of a good or service.

Social benefit The total benefit from consuming a good or service, including both the private benefit and any external benefit.

How a Negative Externality in Production Reduces Economic Efficiency Typically, economists assume that the producer of a good or service must bear all the costs of production. But we now know that this assumption is not always true. In the production of electricity, private costs are borne by the utility, but some external costs of pollution, such as damage from acid rain and climate change, are borne by people who are not customers of the utility. The social cost of producing electricity is the sum of the private cost plus the external cost. Figure 5.1 shows the effect on the market for electricity of a negative externality in production.

S_1 is the market supply curve and represents only the private costs that utilities have to bear in generating electricity. Firms will supply an additional unit of a good or service only if they receive a price equal to the additional cost of producing that unit, so a supply curve represents the *marginal cost* of producing a good or service (see Chapter 4, Section 4.1). If utilities also had to bear the cost of pollution, the supply curve would be S_2, which represents the true marginal social cost of generating electricity. The equilibrium with price $P_{\text{Efficient}}$ and quantity $Q_{\text{Efficient}}$ is efficient. The equilibrium with price P_{Market} and quantity Q_{Market} is not efficient.

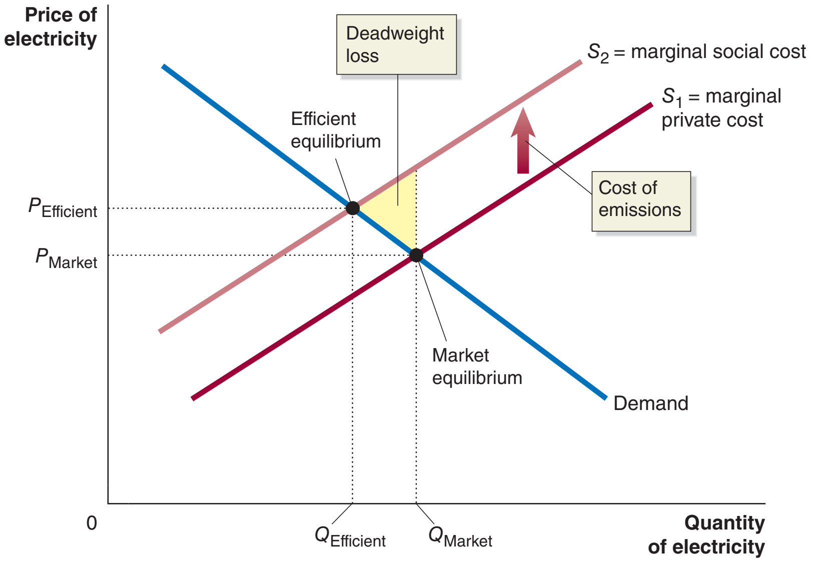


Figure 5.1

The Effect of Pollution on Economic Efficiency

Because utilities do not bear all the cost of the acid rain and climate change caused by emissions, they produce electricity beyond the economically efficient level. Supply curve S_1 represents only the marginal private cost that the utility has to pay. Supply curve S_2 represents the marginal social cost, which includes the costs to those affected by emissions. If the supply curve were S_2 rather than S_1, market equilibrium would occur at price $P_{\text{Efficient}}$ and quantity $Q_{\text{Efficient}}$, the economically efficient level of output. But, when the supply curve is S_1, the market equilibrium occurs at price P_{Market} and quantity Q_{Market}, where there is a deadweight loss equal to the area of the yellow triangle. Because of the deadweight loss, this equilibrium is not efficient.

To see why, remember that an equilibrium is economically efficient if economic surplus—which is the sum of consumer surplus plus producer surplus—is at a maximum (see Chapter 4, Section 4.2). When economic surplus is at a maximum, the net benefit to society from the production of the good or service is at a maximum. With an equilibrium quantity of $Q_{\text{Efficient}}$, economic surplus is at a maximum, and the equilibrium is efficient. But, with an equilibrium quantity of Q_{Market}, economic surplus is reduced by the deadweight loss—equal to the yellow triangle in Figure 5.1—and the equilibrium is not efficient. The deadweight loss occurs because the supply curve is above the demand curve for the production of the units of electricity between $Q_{\text{Efficient}}$ and Q_{Market}. That is, the additional cost—including the external cost—of producing these units is greater than the marginal benefit to consumers, as represented by the demand curve. In other words, because of the cost of the pollution, economic efficiency would be improved if less electricity were produced.

We can conclude the following: *When there is a negative externality in producing a good or service, too much of the good or service will be produced at market equilibrium.*

How a Positive Externality in Consumption Reduces Economic Efficiency We have seen that a negative externality interferes with achieving economic efficiency. The same holds true for a positive externality. In earlier chapters, we assumed that the demand curve represents all the benefits that come from consuming a good. But a college education generates benefits that are not captured by the student receiving the education and so are not included in the market demand curve for college educations. Figure 5.2 shows the effect of a positive externality in consumption on the market for college educations.

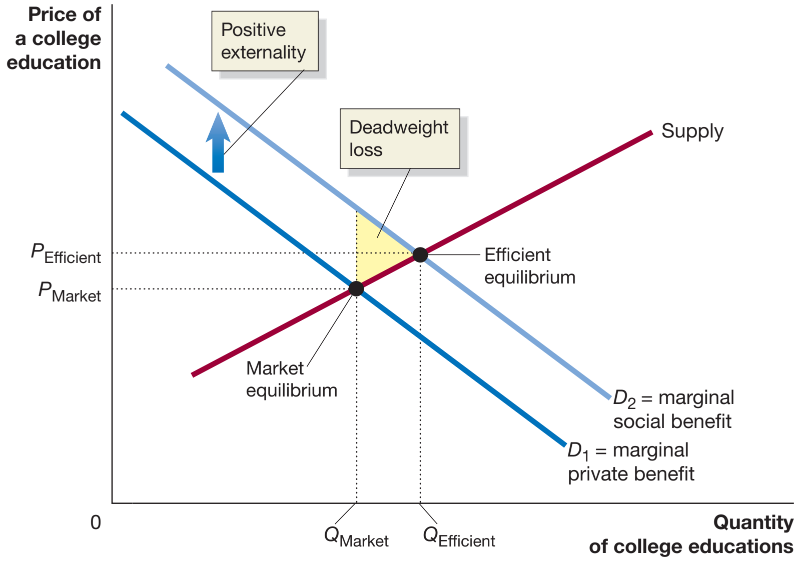
If students receiving a college education could capture all the benefits of that education, the demand curve would be D_2, which represents the marginal social benefits. The actual demand curve is D_1, however, which includes only the marginal private benefits received by students. The efficient equilibrium would occur at price $P_{\text{Efficient}}$ and quantity $Q_{\text{Efficient}}$. At this equilibrium, economic surplus is maximized. The market equilibrium, at price P_{Market} and quantity Q_{Market}, will not be efficient because the demand curve is above the supply curve for production of the units between Q_{Market} and $Q_{\text{Efficient}}$. That is, the marginal benefit—including the external benefit—of producing these units is greater than the marginal cost. As a result, there is a deadweight loss equal to the area of the yellow triangle. Because of the positive externality, economic efficiency would be improved if more college educations were produced.

We can conclude the following: *When there is a positive externality in consuming a good or service, too little of the good or service will be produced at market equilibrium.*

Figure 5.2

The Effect of a Positive Externality on Economic Efficiency

People who do not consume college educations can still benefit from them. As a result, the marginal social benefit from a college education is greater than the marginal private benefit to college students. Because the market demand curve D_1 includes only the marginal private benefit, the quantity of college educations produced, Q_{Market}, is too low. If the market demand curve were D_2 instead of D_1, the level of college educations produced would be $Q_{\text{Efficient}}$, which is the efficient level. At the market equilibrium quantity, Q_{Market}, there is a deadweight loss equal to the area of the yellow triangle.



Externalities and Market Failure

We have seen that because of externalities, the efficient level of output may not occur in either the market for electricity or the market for college educations. These are examples of **market failure**—situations in which the market fails to produce the efficient level of output. In Section 5.3, we will discuss possible solutions to problems of externalities. First, we need to consider why externalities occur.

Market failure A situation in which the market fails to produce the efficient level of output.

What Causes Externalities?

Governments need to guarantee *property rights* in order for a market system to function well (see Chapter 2, Section 2.3). **Property rights** refer to the rights individuals or businesses have to the exclusive use of their property, including the right to buy or sell it. Property can be tangible or physical, such as a store or factory. Property can also be intangible, such as the right to an idea. Most of the time, the governments of the United States and other high-income countries do a good job of enforcing property rights, but in certain situations, property rights do not exist or cannot be legally enforced.

Property rights The rights individuals or businesses have to the exclusive use of their property, including the right to buy or sell it.

Consider the following situation: Lee owns land that includes a lake. A paper company wants to lease some of Lee's land to build a paper mill that will discharge pollutants into his lake. Because Lee owns the lake, he can charge the paper company the cost of cleaning up the pollutants. The result is that the cost of the pollution is a private cost to the paper company and is included in the price of the paper it sells. There is no externality, the efficient level of paper is produced, and there is no market failure.

Now suppose that the paper company again builds its paper mill on privately owned land but discharges its pollutants into a lake that is owned by the state government rather than by an individual. In the absence of any government regulations, the company can discharge pollutants into the lake without having to pay a fee. The cost of the pollution will be external to the company because it doesn't have to pay the cost of the cleanup. The paper mill will produce a quantity of paper that is greater than the economically efficient level, and a market failure will occur. Or, suppose that Lee owns the lake, but the pollution is caused by acid rain generated by an electric utility that is burning coal in a power plant hundreds of miles away. The law does not allow Lee to charge the electric utility for the damage caused by the acid rain. Even though someone is damaging Lee's property, Lee cannot enforce his property rights in this situation. Once again, there is an externality, and the market failure will result in too much electricity being produced.

If you buy a house, the government will protect your right to exclusive use of that house. No one else can use the house without your permission. Because of your property rights in the house, your private benefit and the social benefit from the house are the same. When you buy a college education, however, other people are able to benefit from it. You have no property right that will enable you to prevent other people from benefiting or to charge them for the benefits they receive. As a result, there is a positive externality, and the market failure will result in too few college educations being supplied.

We can conclude the following: *Externalities and market failures result from incomplete property rights or from the difficulty of enforcing property rights in certain situations.*

5.2

Private Solutions to Externalities: The Coase Theorem

LEARNING OBJECTIVE: Discuss the Coase theorem and explain how private bargaining can lead to economic efficiency in a market with an externality.

As noted at the beginning of this chapter, government intervention may increase economic efficiency and enhance the well-being of society when externalities are present. It is also possible, however, for people to find private solutions to the problem of externalities.

Can the market cure market failure? In an influential article written in 1960, the late Ronald Coase, winner of the 1991 Nobel Prize in Economics, argued that under some circumstances, private solutions to the problem of externalities will occur. To understand

Coase's argument, we need to recognize that completely eliminating an externality usually is not economically efficient. Consider pollution, for example. There is, in fact, an *economically efficient level of pollution reduction*. At first, this seems paradoxical. Pollution is bad, and you might think the efficient amount of a bad thing is zero. But it isn't zero.

The Economically Efficient Level of Pollution Reduction

Chapter 1, Section 1.1, introduced the important idea that the optimal decision is to continue any activity up to the point where the marginal benefit equals the marginal cost. This result applies to reducing pollution just as much as it does to other activities. Sulfur dioxide emissions contribute to smog and acid rain. As sulfur dioxide emissions—or any other types of air pollution—decline, society benefits: Fewer trees die, fewer buildings are damaged, and fewer people suffer breathing problems. But, a key point is that the additional benefit—that is, the *marginal benefit*—received from eliminating another ton of sulfur dioxide *declines* as sulfur dioxide emissions are reduced.

To see why, consider what happens if utilities generate electricity by burning coal without attempting to reduce sulfur dioxide emissions. In this situation, many smoggy days will occur in the cities of the Midwest and Northeast. Even healthy people may experience breathing problems. As sulfur dioxide emissions are reduced, the number of smoggy days will fall, and healthy people will no longer experience breathing problems. Eventually, if sulfur dioxide emissions fall to low levels, people with asthma will no longer be affected. Further reductions in sulfur dioxide emissions will have little additional benefit. The same will be true of the other benefits from reducing sulfur dioxide emissions: As the reductions increase, the additional benefits from fewer buildings and trees being damaged and lakes polluted will decline.

Apply the Concept

The Clean Air Act: How a Government Policy Improved Health

Red_pepper82/iStock/Getty Images

Some studies link passage of the Clean Air Act of 1970 to a decline in infant mortality.

The Clean Air Act is often called the most important environmental law ever enacted in the United States. Since Congress passed the law in 1970, the United States has made tremendous progress in reducing air pollution. By 2022, total emissions of the six main air pollutants had fallen by about 70 percent, with carbon monoxide emissions having fallen 75 percent and lead emissions having fallen more than 99 percent. Over the same period, real U.S. gross domestic product (GDP)—which measures the value, corrected for inflation, of all the final goods and services produced in the country—more than tripled, energy consumption increased by half, and the number of miles traveled by all vehicles doubled.

As we have seen, when levels of pollution are high, the marginal benefit of reducing pollution is also high. We would expect, then, that the benefit of reducing air pollution in 1970 was much higher than the benefit from a proportional reduction in air pollution would be today, when the level of pollution is much lower. Several studies have shown that the benefits from the reductions in air pollution that occurred in the period immediately after passage of the Clean Air Act were indeed large. We can briefly discuss three of those studies.

Economists Kenneth Y. Chay of Brown University and Michael Greenstone of the University of Chicago noted that the exposure of pregnant women to high levels of air pollution can be damaging to their unborn children, possibly reducing their lung function. This damage would increase the chance that the infant would die in the first weeks after being born. In the two years following passage of the Clean Air Act, there was a sharp reduction in air pollution and also in infant mortality. The decline was mainly due to a reduction in deaths within one month of birth. Of course, other factors may also have contributed to the decline in infant mortality, but Chay and Greenstone used statistical analysis to isolate the effect of the decline in air pollution. They concluded that "1,300 fewer infants died in 1972 than would have in the absence of the Clean Air Act."

Economists Nicholas J. Sanders of Cornell University and Charles Stoecker of Tulane University analyzed the effect of the Clean Air Act on reducing the stress that fetuses in the womb suffer as a result of pollution. They concluded that in 1972, the reduction in pollution due to the Clean Air Act prevented 9,900 fetal deaths.

Further research by economists Adam Isen of the U.S. Department of the Treasury, Maya Rossin-Slater of Stanford University, and W. Reed Walker of the University of California, Berkeley, indicates that a reduction in exposure to pollution had a lasting effect on people who were small children at the time the act was passed. They estimate that as a result of improved health, the 1.5 million children born each year into the counties that had been the most polluted earn about $4,300 more as adults than they would have if pollution had not been reduced.

Your Turn: Test your understanding by doing related problem 2.8 at the end of this chapter.

What about the marginal cost to electric utilities of reducing pollution? To reduce sulfur dioxide emissions, utilities have to switch from burning high-sulfur coal to burning more costly fuel, or they have to install pollution control devices, such as scrubbers. As the level of pollution falls, further reductions become increasingly costly. Reducing emissions or other types of pollution to very low levels can require complex and expensive new technologies. For example, Arthur Fraas of Resources for the Future and Vincent Munley of Lehigh University have shown that the marginal cost of removing 97 percent of pollutants from municipal wastewater is more than twice as high as the marginal cost of removing 95 percent.

The *net benefit* to society from reducing pollution is equal to the difference between the benefit of reducing pollution and the cost. To maximize the net benefit to society, sulfur dioxide emissions—or any other type of pollution—should be reduced up to the point where the marginal benefit from another ton of reduction is equal to the marginal cost. Figure 5.3 illustrates this conclusion.

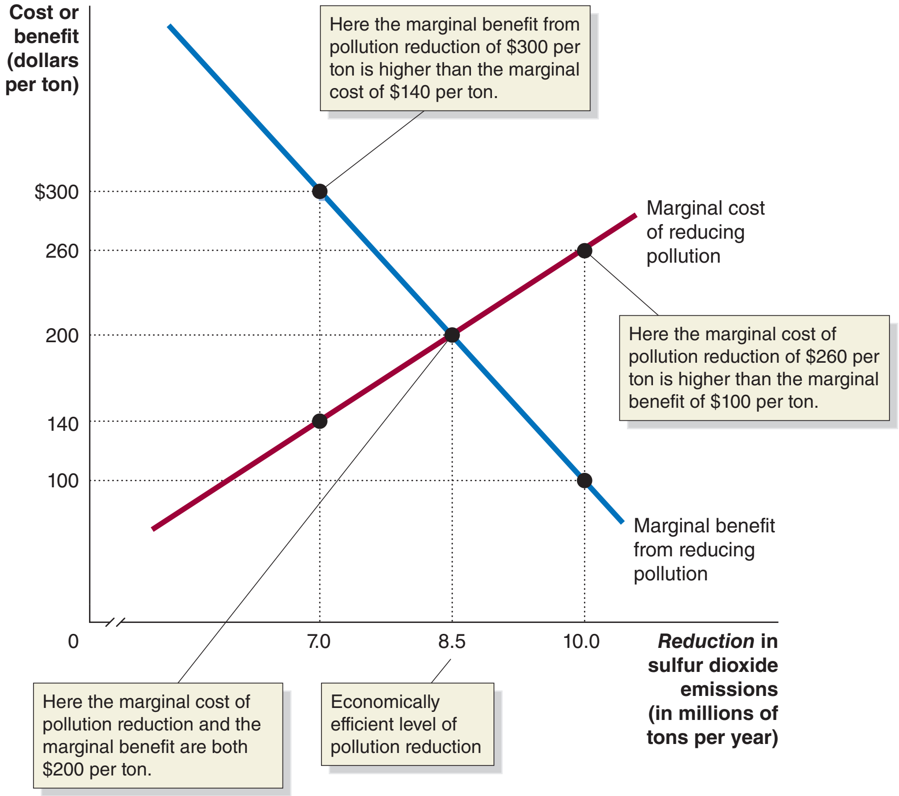


Figure 5.3

The Marginal Benefit from Reducing Pollution Should Equal the Marginal Cost

If the reduction of sulfur dioxide emissions is 7.0 million tons per year, the marginal benefit of $300 per ton is greater than the marginal cost of $140 per ton. Further reductions in emissions will increase the net benefit to society. If the reduction of sulfur dioxide emissions is 10.0 million tons, the marginal cost of $260 per ton is greater than the marginal benefit of $100 per ton. An increase in sulfur dioxide emissions will increase the net benefit to society. Only when the reduction is 8.5 million tons is the marginal benefit equal to the marginal cost. This level is the economically efficient level of pollution reduction.

In Figure 5.3, we measure *reductions* in sulfur dioxide emissions on the horizontal axis. We measure the marginal benefit and marginal cost, in dollars, from eliminating another ton of sulfur dioxide emissions on the vertical axis. As reductions in pollution increase, the marginal benefit declines and the marginal cost increases. The economically efficient amount of pollution reduction occurs where the marginal benefit equals the marginal cost. The figure shows that, in this case, the economically efficient reduction of sulfur dioxide emissions is 8.5 million tons per year. In a program begun in 1990, this is the reduction Congress decided should occur by 2010. At that level of emissions reduction, the marginal benefit and the marginal cost of the last ton of sulfur dioxide emissions eliminated are both \$200 per ton. Suppose that instead the emissions target is only 7.0 million tons per year. The figure shows that, at this level of reduction, the last ton of reduction adds \$300 to the benefits received by society, but it adds only \$140 to the costs of utilities. There is a net benefit to society of \$160 from this ton of pollution reduction. In fact, the figure shows a net benefit to society from pollution reduction for every ton from 7.0 million to 8.5 million. Only when sulfur dioxide emissions are reduced by 8.5 million tons per year will marginal benefit fall enough and marginal cost rise enough that the two are equal.

Now suppose Congress sets the target for sulfur dioxide emissions reduction at 10.0 million tons per year. Figure 5.3 shows that the marginal benefit at that level of reduction falls to only \$100 per ton, and the marginal cost rises to \$260 per ton. The last ton of reduction actually *reduces* the net benefit to society by \$160 per ton. In fact, every ton of reduction beyond 8.5 million reduces the net benefit to society.

To summarize:

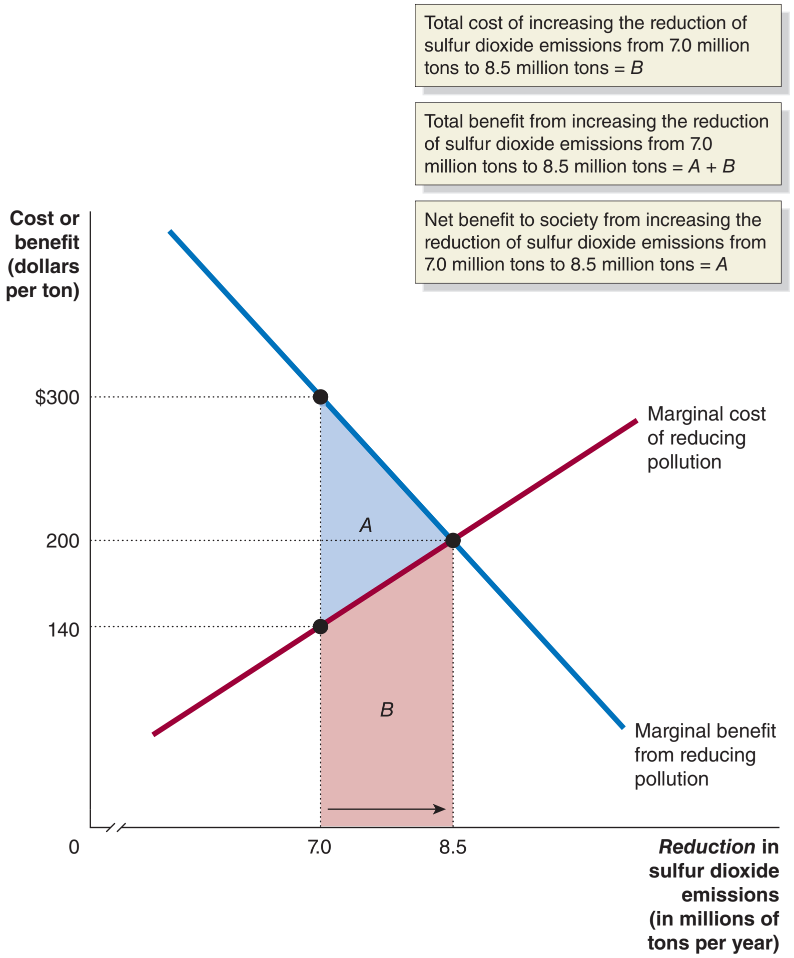
- If the marginal benefit of reducing pollution is greater than the marginal cost, further reductions will make society better off.
- If the marginal cost of reducing pollution is greater than the marginal benefit, further reductions will actually make society worse off.

The Basis for Private Solutions to Externalities

In arguing that private solutions to the problem of externalities were possible, Ronald Coase emphasized that when more than the optimal level of pollution is occurring, the benefits from reducing the pollution to the optimal level are greater than the costs. Figure 5.4 illustrates this point using the example of sulfur dioxide pollution.

The marginal benefit curve shows the additional benefit from each reduction of a ton of sulfur dioxide emissions. The area under the marginal benefit curve between the two emissions levels is the *total* benefit received from reducing emissions from one level to another. For instance, in Figure 5.4, the total benefit from increasing the reduction in sulfur dioxide emissions from 7.0 million tons to 8.5 million tons is the sum of the areas of *A* and *B*. The marginal cost curve shows the additional cost from each reduction of a ton of emissions. The *total* cost of reducing emissions from one level to another is the area under the marginal cost curve between the two emissions levels. The total cost from increasing the reduction in emissions from 7.0 million tons to 8.5 million tons is the area of *B*. The net benefit from reducing emissions is the difference between the total cost and the total benefit, which is equal to the area of *A*.

In Figure 5.4, the benefits from further reductions in sulfur dioxide emissions are much greater than the costs. In the appendix to Chapter 1, we reviewed the formula for calculating the area of a triangle, which is ½ × Base × Height, and the formula for calculating the area of a rectangle, which is Base × Height. Using these formulas, we can calculate the value of the total benefits from the reduction in emissions and the value of the total costs. The value of the benefits $(A + B)$ is \$375 million. The value of the costs (*B*) is \$255 million. If the people who would benefit from a reduction in pollution could get together, they could offer to pay the electric utilities \$255 million to reduce the pollution to the optimal level. After making the payment, they would still be left with a net benefit of \$120 million. In other words, a private agreement to reduce pollution to the optimal level is possible, without any government intervention.



Total cost of increasing the reduction of sulfur dioxide emissions from 7.0 million tons to 8.5 million tons = *B*

Total benefit from increasing the reduction of sulfur dioxide emissions from 7.0 million tons to 8.5 million tons = *A* + *B*

Net benefit to society from increasing the reduction of sulfur dioxide emissions from 7.0 million tons to 8.5 million tons = *A*

Figure 5.4

The Benefits of Reducing Pollution to the Optimal Level Are Greater Than the Costs

Increasing the reduction in sulfur dioxide emissions from 7.0 million tons to 8.5 million tons results in total benefits equal to the sum of the areas of *A* and *B* under the marginal benefit curve. The total cost of this decrease in pollution is equal to the area of *B* under the marginal cost curve. The total benefits are greater than the total costs by an amount equal to the area of *A*. Because the total benefits from reducing pollution are greater than the total costs, it is possible for those receiving the benefits to arrive at a private agreement with polluters to pay them to reduce pollution.

Don't Let This Happen to You

Remember That It's the Net Benefit That Counts

Why not *completely* eliminate something that is unpleasant? As long as any person suffers any negative consequences from air pollution, the marginal benefit of reducing air pollution will be positive. Therefore, removing every particle of air pollution will result in the largest *total* benefit to society. But removing every particle of air pollution is not optimal for the same reason that it is not optimal to remove every particle of dirt or dust when cleaning a room. The cost of cleaning your room is not just the price of the cleaning products but also the opportunity cost of your time. The more time you devote to cleaning your room, the less time you have for other activities. As you devote additional hours to cleaning your room, the alternative activities you have to give up are likely to increase in value, increasing the opportunity cost of cleaning: Cleaning instead of watching television may not be too costly, but cleaning instead of eating or sleeping is very costly. Optimally, you should eliminate dust and dirt in your room up to the point where the marginal benefit of the last particle removed equals the marginal cost of removing it. Society should take the same approach to air pollution. The result is the largest *net* benefit to society.

Your Turn: Test your understanding by doing related problem 2.9 at the end of this chapter.

Do Property Rights Matter?

In discussing the bargaining between the electric utilities and the people suffering the effects of the utilities' pollution, we assumed that the electric utilities were not legally liable for the damage they were causing. In other words, the property of the victims of pollution was not legally protected from damage, so the victims would have to pay the utilities to reduce the pollution. But what if the utilities were legally liable for the damages? As Coase was the first to point out, making the utilities liable would *not* change the *amount* of pollution reduction. The only change would be that the electric utilities would have to pay the victims of pollution for the right to pollute rather than the victims having to pay the utilities to reduce pollution. Because the marginal benefits and marginal costs of pollution reduction would not change, the bargaining should still result in the efficient level of pollution reduction—in this case, 8.5 million tons. To summarize:

- If the utilities are not legally liable, the victims of pollution have an incentive to pay the utilities to reduce pollution up to the point where the marginal benefit of the last ton of reduction is equal to the marginal cost.
- If the utilities are legally liable, they have an incentive to pay the victims of pollution to allow them to pollute up to the same point.

The Problem of Transactions Costs

Transactions costs The costs in time and other resources that parties incur in the process of agreeing to and carrying out an exchange of goods or services.

Unfortunately, polluters and the victims of pollution can have difficulty arriving at a private solution to the problem of externalities. One important reason is that there are often both many polluters and many people suffering from the negative effects of pollution. Negotiating an agreement between the people suffering from pollution and the firms causing the pollution often fails because of the *transactions costs* involved. **Transactions costs** are the costs in time and other resources that parties incur in the process of agreeing to and carrying out an exchange of goods or services. In this case, the transactions costs would include the time and other costs of negotiating an agreement, drawing up a binding contract, and monitoring the agreement. When many people are involved, the transactions costs are often higher than the net benefits from reducing the externality. In that case, the cost of transacting ends up exceeding the gain from the transaction, and a private solution to an externality problem is not feasible.

The Coase Theorem

Coase theorem The argument of economist Ronald Coase that if transactions costs are low, private bargaining will result in an efficient solution to the problem of externalities.

Coase's argument that private solutions to the problem of externalities are possible is summed up in the **Coase theorem**: *If transactions costs are low, private bargaining will result in an efficient solution to the problem of externalities.* We have seen the basis for the Coase theorem in the preceding example of pollution by electric utilities: Because the benefits from reducing an externality are often greater than the costs, private bargaining can lead to an efficient outcome. But we have also seen that this outcome will occur only if transactions costs are low, and in the case of pollution, they usually are not. In general, private bargaining is most likely to reach an efficient outcome if the number of parties bargaining is small.

In practice, we must add two other qualifications to the Coase theorem. In addition to low transactions costs, private solutions to the problem of externalities will occur only if:

1. All parties to the agreement have full information about the costs and benefits associated with the externality. For example, if those suffering from the effects of pollution do not have information on the costs of reducing pollution, it is unlikely that the parties can reach an agreement.
2. All parties are willing to accept a reasonable agreement. In the example of pollution by electric utilities, we saw that the total benefit of reducing sulfur dioxide emissions was $375 million. Even if transactions costs are very low, if the utilities insist on being paid more than $375 million to reduce emissions, no agreement will be reached because the amount paid exceeds the value of the reduction to those suffering from the emissions.

Apply the Concept

How Can You Defend Your Knees on a Plane Flight?

Imagine that you are on a plane and using your laptop on the tray table. Then, with no warning, the person in front of you forcefully reclines her seat, banging your knees and cracking your laptop's screen. Unfortunately, this problem has become common.

Until a few years ago, most seats in the coach section of airplanes had 32 inches of space from the front of one seat to the back of the seat in the next row. But airlines have reconfigured planes to fit more seats. Today, many coach seats have only 29 inches of space, and those missing 3 inches can make a big difference, particularly if you have long legs!

Clearly, there is an externality involved when someone reclines a seat. The person reclining gets the benefit of a more comfortable position, but as the person in the seat behind, you have to bear the cost of a seat reclining into your space. But is it *your* space? If you had a property right to the space, you could choose to make the person in front of you pay a fee to recline her seat. But the airlines own the space, and their policy is to allow people to recline their seats. The airlines' views became clear following incidents involving the Knee Defender, a device invented by Ira Goldman. When you slip Goldman's gadget over the bars on your tray table, it prevents the seat in front of you from being reclined. Fights broke out over the use of the gadget, and most major U.S. airlines banned its use.

Gchutka/E+/Getty Images

If you were on a plane, would you be willing to pay the passenger in front of you to not recline her seat?

The airlines give passengers the right to recline their seats, so what can you do if the person in front of you is squeezing your knees or making it impossible for you to use your laptop on your tray table? If the cost to you from these problems is greater than the benefit to the person in front of you from reclining, there should be a payment that you can make to that person in exchange for not reclining. That's the solution that Josh Barro, a columnist and frequent flier, suggested: "If my reclining bothers you, you can pay me to stop." He was skeptical that many people really are bothered by having the seat in front of them reclined: "If they really cared that much, someone would have opened his wallet and paid me by now."

Applying Coase's theorem, Barro's analysis seems to be correct: If the cost to you from having the seat in front of yours reclined is greater than the benefit to the recliner, you should make a payment to the recliner. Because this outcome rarely occurs, people reclining must get a larger benefit than the cost imposed on people behind them. But economist Donald Marron of the Urban Institute argues that this analysis holds only if we assume that the transactions costs of negotiating an agreement are low. If many people don't like the idea of negotiating with a stranger about a payment for not reclining a seat, then the transactions costs might be too high for the efficient outcome to occur.

Ronald Coase passed away in 2013 without discussing how he dealt with the issue of someone in front of him reclining his or her seat.

Your Turn: Test your understanding by doing related problems 2.10 and 2.11 at the end of this chapter.

5.3 Government Policies to Deal with Externalities

LEARNING OBJECTIVE: Analyze government policies to achieve economic efficiency in a market with an externality.

When private solutions to externalities are not feasible, how should the government intervene? British economist A. C. Pigou of Cambridge University was the first to analyze market failure systematically and to suggest an answer to that question.

Imposing a Tax When There Is a Negative Externality

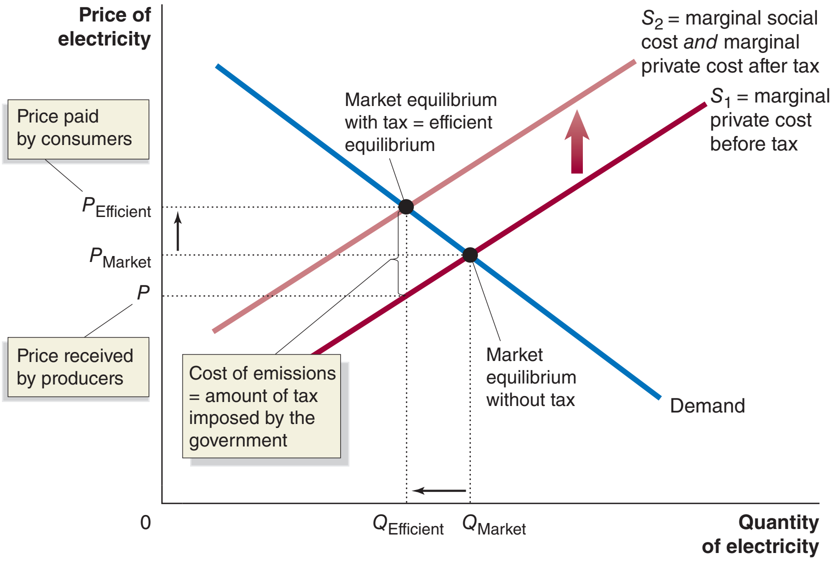
Pigou argued that to deal with a negative externality in production, the government should impose a tax equal to the cost of the externality. The effect of such a tax is shown in Figure 5.5, which reproduces the negative externality from generating electricity shown in Figure 5.1.

By imposing a tax on the production of electricity equal to the cost of the damage caused by the emissions, the government will cause electric utilities to *internalize* the externality. As a consequence, the cost of emissions will become a private cost borne by the utilities, and the supply curve for electricity will shift from S_1 to S_2. The result will be a

Figure 5.5

When There Is a Negative Externality, a Tax Can Lead to the Efficient Level of Output

Because utilities do not bear all the cost of acid rain and climate change caused by emissions, they produce electricity beyond the economically efficient level. If the government imposes a tax equal to the cost of the damage from the emissions, the utilities will internalize the externality. As a consequence, the supply curve will shift up, from S_1 to S_2. The market equilibrium quantity changes from Q_{Market}, where an inefficiently high level of electricity is produced, to $Q_{\text{Efficient}}$, the economically efficient equilibrium quantity. The price of electricity will rise from P_{Market}—which does not include the cost of acid rain—to $P_{\text{Efficient}}$—which does include the cost. Consumers pay the price $P_{\text{Efficient}}$, while producers receive the price P, which is equal to $P_{\text{Efficient}}$ minus the amount of the tax.



decrease in the equilibrium output of electricity from Q_{Market} to the efficient level, $Q_{\text{Efficient}}$. The price consumers pay for electricity will rise from P_{Market} (which does not include the cost of damage caused by the emissions) to $P_{\text{Efficient}}$ (which does include the cost). Producers will receive the price P, which is equal to $P_{\text{Efficient}}$ minus the amount of the tax.

Providing a Subsidy When There Is a Positive Externality

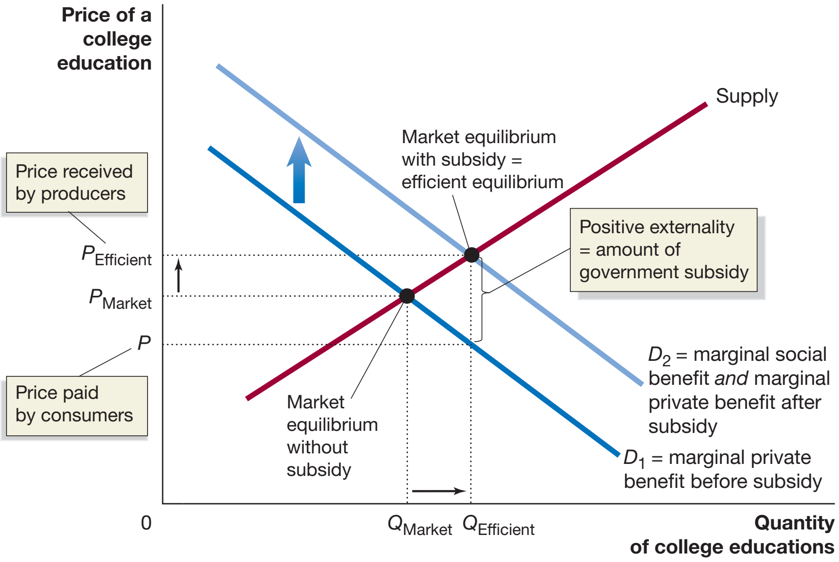
Pigou reasoned that the government can deal with a positive externality in consumption by giving consumers a subsidy, or payment, equal to the value of the externality. The effect of such a subsidy is shown in Figure 5.6, which reproduces the positive externality from college education shown in Figure 5.2.

By paying college students a subsidy equal to the external benefit from a college education, the government will cause students to *internalize* the externality. That is, the external benefit from a college education will become a private benefit received by college students, and the demand curve for college educations will shift from D_1 to D_2. The equilibrium quantity of college educations supplied will increase from Q_{Market} to the

Figure 5.6

When There Is a Positive Externality, a Subsidy Can Lead to the Efficient Level of Output

People who do not consume college educations can benefit from them. As a result, the social benefit from a college education is greater than the private benefit to college students. If the government pays a subsidy equal to the external benefit, students will internalize the externality. The subsidy will cause the demand curve to shift up, from D_1 to D_2. As a result, the market equilibrium quantity will shift from Q_{Market}, where an inefficiently low level of college educations is supplied, to $Q_{\text{Efficient}}$, the economically efficient equilibrium quantity. Producers receive the price $P_{\text{Efficient}}$, while consumers pay the price P, which is equal to $P_{\text{Efficient}}$ minus the amount of the subsidy.



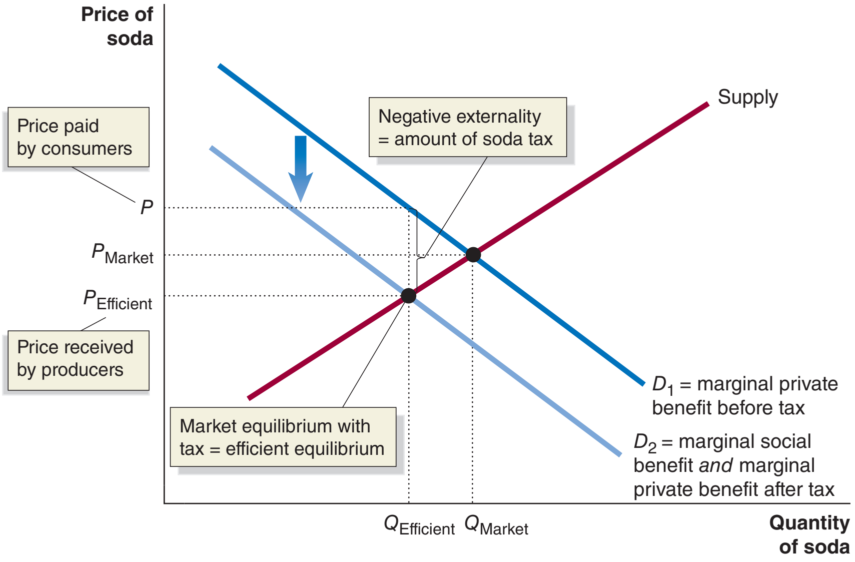
efficient level, $Q_{\text{Efficient}}$. Producers receive the price $P_{\text{Efficient}}$, while consumers pay the price P, which is equal to $P_{\text{Efficient}}$ minus the amount of the subsidy. In fact, the government does heavily subsidize college educations. All states have government-operated universities that charge tuition well below the cost of providing the education. The federal government and state governments also provide students with grants and low-interest loans that subsidize college educations. The economic justification for these programs is that college educations provide an external benefit to society.

Apply the Concept

Should the Government Tax Cigarettes and Soda?

Generally, governments use taxes to deal with negative externalities in *production*. Governments also impose taxes—sometimes called *sin taxes*—on products such as cigarettes and alcohol. Some policymakers have argued that these products generate negative externalities in *consumption*, so a tax on them can increase economic efficiency. Several cities tax sweetened sodas, on the grounds that they cause a negative externality by raising medical costs. For example, Seattle, Berkeley, and Philadelphia tax sweetened beverages by the ounce. Just as governments can deal with a positive externality in consumption by giving consumers a subsidy, they can deal with a negative externality by imposing a tax.

As the following figure shows, by imposing a tax on soda, the government will cause consumers to internalize the externality. That is, the external cost to drinking soda will become a private cost paid by consumers. Because consumers now have to pay a tax on soda, at every quantity, they are willing to pay less than they would have without the tax, so the demand curve for soda will shift down by the amount of the tax, from D_1 to D_2. The equilibrium quantity of sodas consumed will decrease from Q_{Market} to the efficient level, $Q_{\text{Efficient}}$. (Note that, as we saw in Chapter 4, we get the same result whether the government imposes a tax on the buyers of a good or on the sellers.)



But do people actually cause a negative externality by drinking sweetened sodas or by smoking? It might seem that they don't because consumers of sodas and cigarettes bear the costs of any health problems they experience. In fact, though, the higher medical expenses from treating the complications of obesity or cigarette smoking are not paid entirely by soda drinkers or smokers. A smoker who receives health insurance through his employer may increase the costs of that insurance, which all the workers at the firm will pay. Similarly, taxpayers partly pay for the health care of someone who is over age 65 and is enrolled in the federal government's Medicare program. The costs of medical care that smokers or soda drinkers do not pay themselves represent a negative externality. Smokers and people who are obese are also more likely to be absent from work, which can impose a cost on their employers and other workers at their firms.

There is a complication to this conclusion, however: Smokers and people who are obese tend to die early. This tragic outcome means that people in both groups may have been paying taxes to help pay for Social Security and Medicare benefits that they will never receive. They may also have made payments into company and public employee pension plans and purchased long-term care insurance, but they may not have lived long enough to receive many pension payments or to have spent time in a nursing home. So, there are offsetting effects: While alive, smokers and obese people may impose costs on others who bear the expense of their higher medical costs, but because they are likely to die early, they provide a financial gain to recipients of Social Security, Medicare, company and public employee pension plans, and purchasers of long-term care insurance.

Economist W. Kip Viscusi of Vanderbilt University has studied the case of tobacco smoking and concluded that the external costs and benefits roughly offset each other, meaning that there doesn't appear to be a significant negative externality from smoking. Studies of obesity have arrived at somewhat conflicting results: A study of obesity in the Netherlands found that the cost savings from premature death offset the additional lifetime medical costs of obese people. But another study using U.S. data found that obesity did lead to a net increase in lifetime medical costs, even taking into account the shorter average life spans of obese people.

There may also be costs to smoking and obesity beyond additional medical costs. Smokers may inflict costs on others because of secondhand smoke or because smoking during pregnancy can lead to low birth weights and other health problems for babies. On average, people who are obese miss more days of work and have lower productivity, which imposes a cost on their employers and on the people they work with.

Economists and policymakers continue to debate whether the government should use taxes to deal with negative externalities in consumption.

Your Turn: Test your understanding by doing related problem 3.8 at the end of this chapter.

Solved Problem 5.3

During a Pandemic, Should Governments Restrict Indoor Dining or Impose a Tax on Restaurant Meals?

Policymakers faced difficult decisions during the Covid–19 pandemic. For example, beginning in March 2020 and continuing for over a year, local governments in some cities and states restricted or banned social gatherings such as parties and weddings—particularly those held indoors. State and local governments also limited the number of people allowed in restaurants and movie theaters. In imposing these restrictions, the governments relied on a consensus among scientists that Covid–19 is mainly spread through being in close proximity to other people for extended periods.

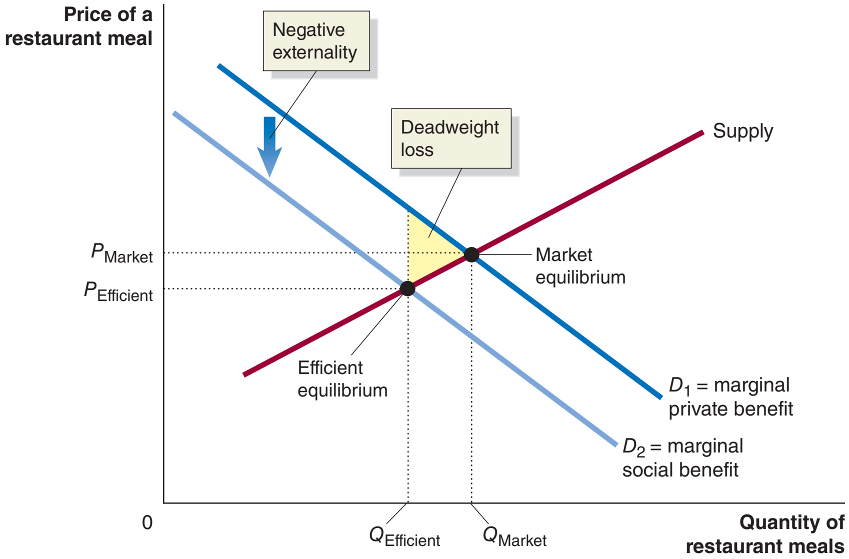
a. There are potential risks to engaging in many activities, including skydiving, rock climbing, and deep sea diving. Typically, the government doesn't restrict the number of people who can engage in these activities. Instead, the government lets individuals weigh the enjoyment they receive from the activities against the risks. Why, then, did some local governments decide during the Covid–19 pandemic to restrict the number of people who could dine in a restaurant? Illustrate your answer with a graph showing the market for meals eaten inside restaurants during a pandemic.

b. Why did the government restrict how many people could dine in a restaurant rather than use a tax to deal with the situation you describe in part (a)?

Solving the Problem

Step 1: Review the chapter material. This problem is about the government dealing with a negative externality, so you may want to review the section "Government Policies to Deal with Externalities."

Step 2: Answer part (a) by explaining why local governments might want to limit the number of people who can eat in restaurants during a pandemic while not restricting the number of people who can engage in hazardous activities such as skydiving. A key difference between skydiving and eating a meal inside a restaurant during a pandemic is that with skydiving, the participant bears all the costs of an accident, but someone who eats inside a restaurant during a pandemic not only runs the risk of catching a disease but may also spread the disease to other people. In other words, there is a negative externality in consumption from eating the meal because the cost from spreading the virus is borne by other people. So, your graph should have the demand curve (D_2) representing marginal social benefit being below the demand curve (D_1) representing marginal private benefit by the amount of the negative externality. Your graph should also show the market equilibrium quantity of meals, Q_{Market}, being greater than the efficient equilibrium quantity, $Q_{\text{Efficient}}$. Finally, as in the following graph, your graph should show the area of deadweight loss resulting from an economically inefficient quantity of restaurant meals being consumed.



Step 3: Answer part (b) by discussing why a government might deal with this externality in consumption by restricting indoor dining rather than by imposing a tax. A tax on restaurant meals equal to the per-unit cost of the externality would shift the marginal private benefit curve, D_1, down to where it became the same as the marginal social benefit curve, D_2. The tax would lead people eating in restaurants to internalize the cost of the externality, and it would cause the market quantity of restaurant meals to decline to the efficient quantity, $Q_{\text{Efficient}}$.

In practice, however, cities would have had difficulty deciding on the size of the tax necessary to push the market equilibrium to the efficient quantity of restaurant meals. During the Covid–19 pandemic, doctors and epidemiologists didn't always agree on how much indoor dining contributed to the spread of the virus. Therefore, not enough information was available to accurately estimate the size of the tax needed. As a result, local governments relied on restrictions on indoor dining rather than on taxes to deal with the externality.

Your Turn: For more practice, do related problems 3.9, 3.10, and 3.11 at the end of this chapter.

Pigovian taxes and subsidies Government taxes and subsidies intended to bring about an efficient level of output in the presence of externalities.

Because Pigou was the first economist to propose using government taxes and subsidies to deal with externalities, they are sometimes called **Pigovian taxes and subsidies**. Note that a Pigovian tax eliminates the deadweight loss and improves economic efficiency, unlike most other taxes, which are intended simply to raise revenue and can reduce consumer surplus and producer surplus and create a deadweight loss (see Chapter 4, Section 4.4). In fact, one reason that economists support Pigovian taxes as a way to deal with negative externalities is that the government can use the revenues raised by Pigovian taxes to lower other taxes that reduce economic efficiency. For instance, the Canadian province of British Columbia has enacted a Pigovian tax on carbon dioxide emissions and uses the revenue raised to reduce personal income taxes.

Command-and-Control versus Market-Based Approaches

Command-and-control approach A policy that involves the government imposing quantitative limits on the amount of pollution firms are allowed to emit or requiring firms to install specific pollution control devices.

Although the federal government has sometimes used taxes and subsidies to deal with externalities, it has more frequently used a *command-and-control approach* to deal with pollution. A **command-and-control approach** involves the government imposing quantitative limits on the amount of pollution firms are allowed to emit or requiring firms to install specific pollution control devices. For example, since the 1980s, the federal government has required auto manufacturers such as Ford and General Motors to install catalytic converters to reduce auto emissions on all new automobiles. Since 2012, the federal government has required efficiency standards for light bulbs that have effectively ended the sale of traditional incandescent bulbs, which accounted for more than two-thirds of light bulbs sold in the United States in 2010.

Congress could have used a command-and-control approach to achieve its goal of reducing sulfur dioxide emissions by 8.5 million tons per year by 2010. However, such an approach would not have been an economically efficient solution to the problem because utilities can have very different costs of reducing sulfur dioxide emissions. Some utilities that already used low-sulfur coal could reduce emissions further only at a high cost. Other utilities, particularly those in the Midwest, were able to reduce emissions at a lower cost by switching from high-sulfur coal to low-sulfur coal.

Congress decided to use a market-based approach to reducing sulfur dioxide emissions by setting up a *cap-and-trade system* of tradable emissions allowances. The federal government gave allowances to utilities equal to the total target amount of sulfur dioxide emissions. The utilities were then free to buy and sell the allowances on the Chicago Mercantile Exchange. Utilities that could reduce emissions at low cost did so and sold their allowances to utilities that could only reduce emissions at high cost.

Using tradable emissions allowances to reduce acid rain was a success in that it made it possible for utilities to meet Congress's emissions goal at a much lower cost than expected. Just before Congress enacted the allowances program in 1990, the Edison Electric Institute estimated that the cost to utilities of complying with the program would be \$7.4 billion per year by 2010. By 1994, the federal government's General Accountability Office estimated that the cost would be less than \$2 billion per year. In practice, the cost was almost 90 percent less than the initial estimate, or only about \$870 *million* per year.

The End of the Sulfur Dioxide Cap-and-Trade System

The dollar value of the total benefits of reducing sulfur dioxide emissions turned out to be at least 25 times as large as the costs. Despite its successes, however, the sulfur dioxide cap-and-trade system had effectively ended by 2013. Over the years, research showed that sulfur dioxide emissions had caused more illnesses than had been initially thought. In response to these findings, President George W. Bush proposed legislation lowering the cap on sulfur dioxide emissions, but Congress did not pass the legislation. Court rulings kept the Environmental Protection Agency (EPA) from using regulations to set up a new trading system for sulfur dioxide allowances with a lower cap. As a result, the EPA reverted to the previous system of setting limits on sulfur dioxide emissions at the state or individual power plant level.

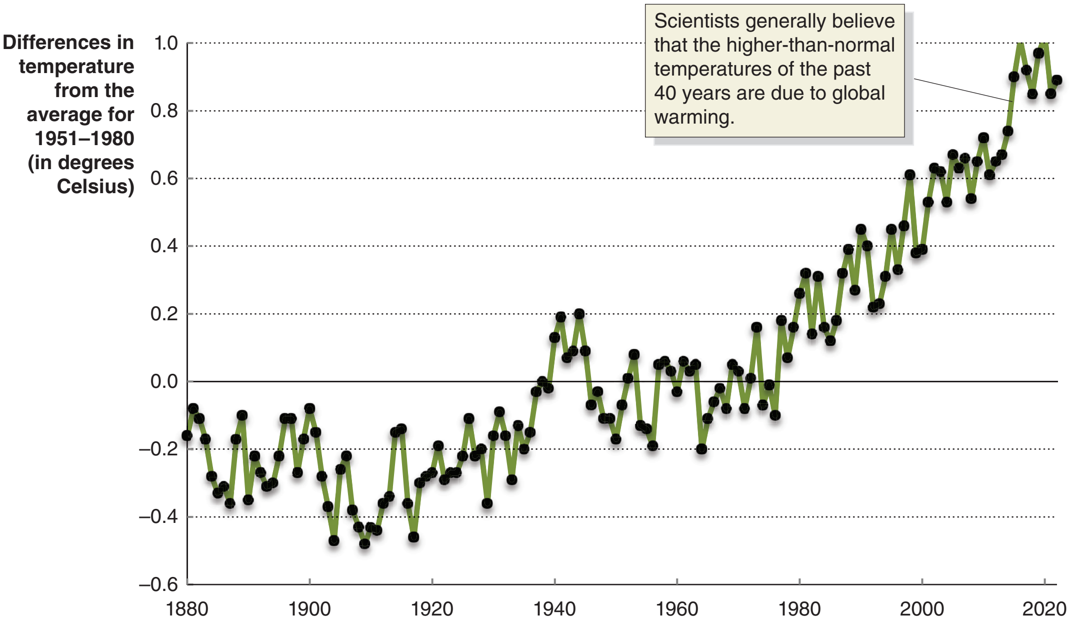
Because nationwide trading of emissions allowances was no longer possible, the allowances lost their value. Many economists continue to believe that using market-based policies, such as the sulfur dioxide cap-and-trade system, is an efficient way to deal with the externalities of pollution. But in the end, any policy requires substantial political support to be enacted and maintained.

Are Tradable Emissions Allowances Licenses to Pollute?

Tradable emissions allowances face a political problem. While many environmentalists support these allowances, other environmentalists have criticized the allowances for being "licenses to pollute." These environmentalists argue that just as the government does not issue licenses to rob banks or drive drunk, it should not issue licenses to pollute. But this criticism ignores one of the central lessons of economics: Because resources are scarce, trade-offs exist. Resources that are spent on reducing one type of pollution are not available to reduce other types of pollution or for any other use. Because reducing acid rain using tradable emissions allowances cost utilities $870 million per year, rather than $7.4 billion, as originally estimated, society saved more than $6.5 billion per year.

Global Warming

In 2022, the average global temperature was about 1.60 degrees Fahrenheit (or 0.89 degree Celsius) warmer than the average temperature for the period between 1951 and 1980. Figure 5.7 shows the difference between the world surface air temperature in each year since 1880 and the average temperature for the period 1951–1980. Over the centuries, global temperatures have gone through many long periods of warming and cooling. Nevertheless, most scientists are convinced that the recent warming trend is not part of the natural fluctuations in temperature but is primarily a result of the burning of fossil fuels like coal and gasoline. Burning these fuels releases carbon dioxide, which accumulates in the atmosphere as a greenhouse gas. (According to estimates by the EPA, carbon dioxide accounts for about 76 percent of total global emissions of greenhouse gases that contribute to climate change. Methane and nitrous oxide, mainly from agricultural activity, make up most of the rest of greenhouse gas emissions.) Greenhouse gases cause some of the heat released from the earth to be reflected back, increasing the



Scientists generally believe that the higher-than-normal temperatures of the past 40 years are due to global warming.

Figure 5.7 **Changes in Average Global Surface Air Temperature Since 1880**

The graph shows the differences between the world surface air temperatures in each year between 1880 and 2022 and the average temperature for the years 1951 to 1980. In 2022, the average global temperature was about 1.60 degrees Fahrenheit (or 0.89 degree Celsius) warmer than the average temperature for the years 1951 to 1980.

Source: NASA, Goddard Institute for Space Studies, data.giss.nasa.gov/gistemp.

earth's temperature. Worldwide annual carbon dioxide emissions increased from about 198 million metric tons of carbon in 1850 to 3,855 million metric tons in 1930 and to 37,120 million metric tons in 2021.

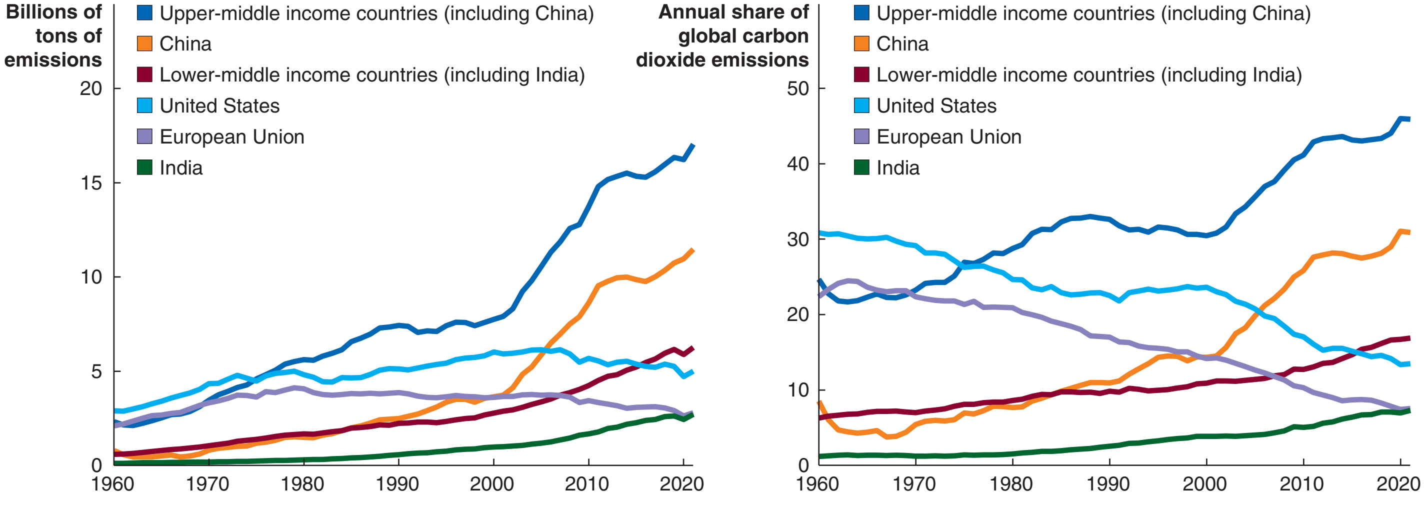
If greenhouse gases continue to accumulate in the atmosphere, according to some estimates, global temperatures could increase by 3 degrees Fahrenheit (or 1.67 degrees Celsius) or more during the next 100 years. Such an increase in temperature could lead to significant changes in climate, which might result in more severe hurricanes and other violent weather conditions, disrupt farming in many parts of the world, and lead to increases in sea levels, which could result in flooding in coastal areas. In 2018, the federal government's *Fourth National Climate Assessment* forecast that by 2090, climate change will cause $500 billion worth of economic damage in the United States each year.

U.S. Carbon Dioxide Emissions in a Global Context

In this section, we look at U.S. carbon dioxide emissions relative to emissions by other countries or groups of countries.

Panel (a) of Figure 5.8 shows, for each year between 1960 and 2021, the total amount of carbon dioxide emissions by the United States, China, India, the 28 countries in the European Union (including France, Germany, Spain, and Italy), lower-middle-income countries (including India, Nigeria, and Vietnam), and upper-middle-income countries (including China, Brazil, and Argentina).

Panel (b) of Figure 5.8 shows the percentage of total world carbon dioxide accounted for by each of the three individual countries and by the indicated groups of countries. In 2021, the United States accounted for about 13.5 percent of world carbon dioxide emissions and the 27 countries in the European Union accounted for about 7.5 percent. China accounted for 30.9 percent and India accounted for 7.3 percent. In the United States and in the countries of the European Union, both total emissions and the percentage of total world emissions have been declining over the past 15 years. Emissions have been increasing in China, India, and middle-income countries. Note that the reductions in emissions during 2020 largely reflect the effects of the slowdown in economic activity as a result of the Covid–19 pandemic.



(a) Annual carbon dioxide emissions

(b) Share of global carbon dioxide emissions

Figure 5.8 **Annual Carbon Dioxide Emissions**

In the United States and in the countries of the European Union, both total emissions and the percentage of total world emissions have been declining over the past 15 years. Emissions have been increasing in China, India, and middle-income countries.

Source: Created using data from Hannah Ritchie, Max Roser, and Pablo Rosado, "CO_2 and Greenhouse Gas Emissions," ourworldindata.org.

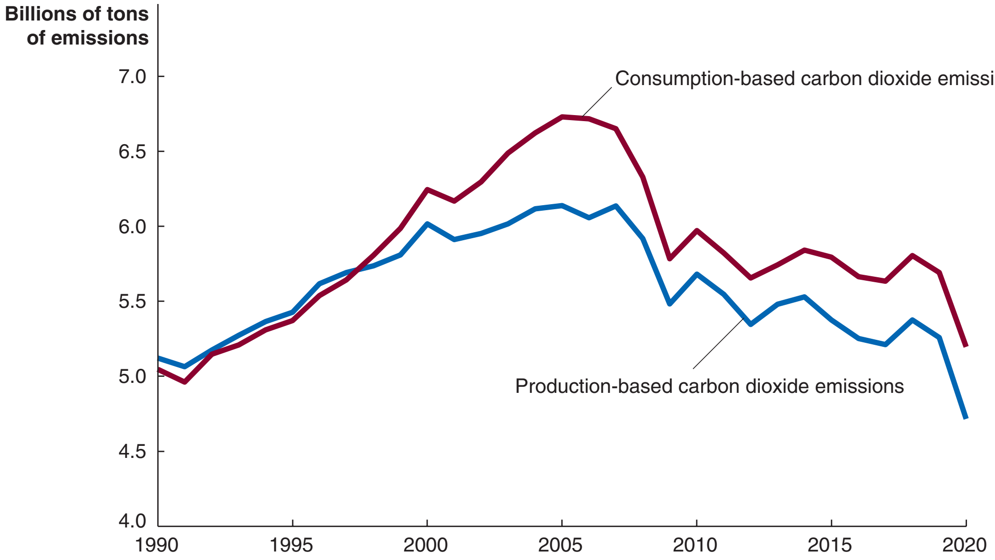


Figure 5.9 **Measuring Carbon Dioxide Emissions on the Basis of Goods Produced in the United States and on the Basis of Goods Consumed in the United States**

It makes only a small difference whether we measure carbon dioxide emissions on the basis of production of goods and services in the United States or on the basis of consumption of goods and services in the United States.

Source: Created using data from Hannah Ritchie, "How Do CO_2 Emissions Compare When We Adjust for Trade?" ourworldindata.org.

Figure 5.8 measures a country's contribution to carbon dioxide emissions by measuring the quantity of emissions generated by *production* within the country. But suppose, instead, that we measure the quantity of carbon dioxide emitted during the production of the goods *consumed* within the country, including the carbon dioxide emitted in the production of goods that the country imports? In that case, we would allocate to the United States carbon dioxide emitted during the production of a good, such as a television or a shirt, that was produced in China or another foreign country but consumed in the United States. Some commentators have argued that the United States and other high-income countries have *exported pollution* by consuming goods that are manufactured in other countries.

At least for the United States, as Figure 5.9 shows, it makes only a small difference whether we measure carbon dioxide emissions on the basis of production of goods and services or on the basis of consumption of goods and services. U.S. emissions of carbon dioxide are only about 7 percent higher when measured on a consumption basis rather than on a production basis. By both measures, U.S. emissions of carbon dioxide have generally been declining since about 2007. (Note that 1990 is the first year for which these two measures are available.)

Government Policy Responses to Global Warming

Governments in many countries have attempted to slow the pace of climate change by enacting policies to reduce carbon dioxide emissions. In August 2022, Congress and President Biden enacted additional measures, including federal government subsidies to firms and households to use renewable energy such as rooftop solar panels, tax rebates for some buyers of certain electric vehicles, and funds for utilities to develop power sources such as wind and solar that don't emit carbon dioxide. The measures have been estimated to reduce U.S. greenhouse gas emissions by somewhere between 6 percent and 15 percent. As shown in panel (b) of Figure 5.8, the United States is responsible for only about 13.5 percent of annual total global carbon dioxide emissions, so the measures would likely reduce global greenhouse gas emissions by only about 2 percent.

Although action by the United States and other high-income countries can contribute to slowing the pace of global warming, significantly slowing temperature increases will likely require coordinating policy across many countries. Such coordination, however, has proven difficult. In 2015, representatives from 195 nations who met in Paris agreed to restrict emissions of greenhouse gases, with the goal of keeping the average temperature from rising more than 1.5 degrees Celsius (or 2.7 degrees Fahrenheit) from the average temperature during the years 1850 to 1900. In 2017, the Trump administration withdrew from the *Paris Climate Accords*, although the Biden administration reversed this decision and rejoined the accords in 2021. In 2022, a United Nations report indicated that countries were failing to meet their commitments under the Paris Climate Accords and that average temperatures were likely to rise by between 2.4 and 3.5 degrees Celsius (or 4.3 to 6.3 degrees Fahrenheit) by the year 2100.

Using a Carbon Tax to Slow Global Warming

Many economists favor a carbon tax, which is a market-based policy to reduce carbon dioxide emissions. Economists working at the U.S. Department of the Treasury's Office of Tax Analysis have estimated that the marginal social cost of carbon dioxide emissions is about $49 per metric ton. A carbon tax would be intended to replace other regulations on the emissions of carbon dioxide, relying instead on market forces responding to an increase in the price of products that result in carbon dioxide emissions. For example, a $49-per-ton carbon tax would raise the price of gasoline by about $0.44 per gallon. This price increase would lead some consumers to switch from cars and trucks with poor fuel mileage to vehicles with better fuel efficiency and to electric cars and trucks that have zero carbon emissions.

A carbon tax would also provide an incentive for households and firms to adopt renewable sources of electricity generation, such as solar, wind, and geothermal power. In addition, as we saw in the chapter opener, nuclear fusion promises to be a low-cost way of generating clean energy. A carbon tax might provide an economic incentive to develop commercial uses of nuclear fusion technology.

Treasury Department economists estimate that a carbon tax set at $49 per ton and increased to $70 per ton over 10 years would raise tax revenue of about $2.2 trillion over that period. Because lower-income households spend a larger fraction of their incomes on products with high carbon content such as gasoline and heating oil than do higher-income households, they would bear a proportionally larger share of the tax. Most proposals for a carbon tax include a way of refunding to lower-income households some part of their higher tax payments, possibly by increasing the *Earned Income Tax Credit* (EITC), which we discussed in an *Apply the Concept* in Chapter 4, Section 4.3.

There is significant opposition to a carbon tax among some economists and policymakers. A carbon tax would increase the costs in industries that rely heavily on electricity or on transportation. Unsurprisingly, these firms and their workers oppose a carbon tax. In addition, unless a carbon tax were adopted internationally, it would make only a limited contribution to slowing climate change while putting U.S. industries, such as chemicals and aluminum, that consume large amounts of energy at a disadvantage compared to foreign competitors. In 2022, there was only very limited support for a carbon tax from members of Congress.

The debate over policies to deal with climate change is likely to continue for many years.

Apply the Concept

Does the United States Need a Green New Deal?

Some policymakers favor a much more vigorous response to the problem of climate change. Representative Alexandria Ocasio-Cortez of New York and Senator Ed Markey of Massachusetts have introduced a resolution in Congress for a Green New Deal (GND) to counteract climate change. The name is a reference to the New Deal programs that President Franklin Roosevelt and Congress enacted to address the economic problems of the Great Depression of the 1930s.

Although the sponsors of the GND have not specified all the details of the plan, the following are some of the main points of the proposal:

1. Meet "100 percent of the power demand in the United States through clean, renewable, and zero-emission energy sources."
2. Upgrade "all existing buildings in the United States and [build] new buildings to achieve maximum energy efficiency."
3. "Remove pollution and greenhouse gas emissions from the agricultural sector as much as is technologically feasible."
4. Overhaul "transportation systems in the United States to remove pollution and greenhouse gas emissions . . . as much as is technologically feasible, including through investment in (i) zero-emission vehicle infrastructure and manufacturing; (ii) clean, affordable, and accessible public transit; and (iii) high-speed rail."

The GND seemed likely to require additional federal government spending of $1 trillion per year or more. In 2022, total federal government spending on goods and services was only $1.7 trillion, so the GND would involve a substantial increase in the size of the federal government. It also appeared likely that the GND's goals would require extensive use of command-and-control policies, such as directing utilities to employ specific technologies to eliminate carbon emissions. In late 2023, although the Biden administration had adopted some policies similar to those in the GND, it appeared unlikely to expand its climate policy to include all of the key parts of the GND listed above.

US Senate/Alamy Stock Photo

Representative Alexandria Ocasio-Cortez of New York and Senator Ed Markey of Massachusetts have introduced a resolution in Congress for a Green New Deal (GND) to counteract climate change.

Your Turn: Test your understanding by doing related problems 3.13, 3.14, 3.15, and 3.16 at the end of this chapter.

5.4 Four Categories of Goods

LEARNING OBJECTIVE: Categorize goods on the basis of whether they are rival or excludable and use graphs to illustrate the efficient quantities of public goods and common resources.

We can explore further the question of when the market is likely to succeed in supplying the efficient quantity of a good by understanding that goods differ on the basis of whether their consumption is *rival* and *excludable*:

- **Rivalry** occurs when one person's consumption of a unit of a good means no one else can consume it. If you consume a Big Mac, for example, no one else can consume it.
- **Excludability** means that anyone who does not pay for a good cannot consume it. If you don't pay for a Big Mac, McDonald's can exclude you from consuming it.

The consumption of a Big Mac is therefore both rival and excludable.

Rivalry The situation that occurs when one person's consumption of a unit of a good means no one else can consume it.

Excludability The situation in which anyone who does not pay for a good cannot consume it.

The consumption of some goods, however, can be either *nonrival* or *nonexcludable*:

- *Nonrival* means that one person's consumption does not interfere with another person's consumption.
- *Nonexcludable* means that it is impossible to exclude others from consuming the good, whether they have paid for it or not.

Figure 5.10 shows four possible categories into which goods can fall:

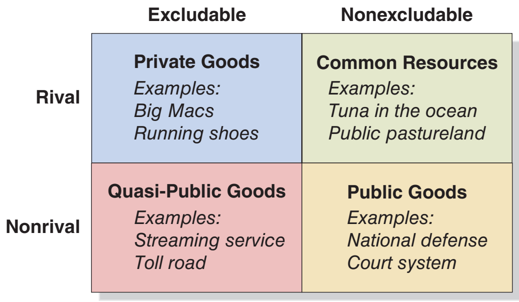
1. A **private good** is both rival and excludable. Food, clothing, haircuts, and many other goods and services fall into this category. One person's consuming a unit of these goods keeps other people from consuming that unit, and no one can consume these goods without buying them. Although we didn't state it explicitly, when we analyzed the demand and supply for goods and services in Chapters 3 and 4, we assumed that the goods and services are all private goods.

Private good A good that is both rival and excludable.

Figure 5.10

Four Categories of Goods

Goods and services can be divided into four categories on the basis of whether people can be excluded from consuming them and whether they are rival in consumption. A good or service is rival in consumption if one person consuming a unit of the good means that another person cannot consume that unit.



	Excludable	Nonexcludable
Rival	**Private Goods** *Examples:* *Big Macs* *Running shoes*	**Common Resources** *Examples:* *Tuna in the ocean* *Public pastureland*
Nonrival	**Quasi-Public Goods** *Examples:* *Streaming service* *Toll road*	**Public Goods** *Examples:* *National defense* *Court system*

Public good A good that is both nonrival and nonexcludable.

Free riding Benefiting from a good without paying for it.

2. A **public good** is both nonrival and nonexcludable. Public goods are often, although not always, supplied by a government rather than by private firms. The classic example of a public good is national defense. Your consuming national defense does not interfere with your neighbor consuming it, so consumption is nonrival. You also cannot be excluded from consuming it, whether you pay for it or not. No private firm would be willing to supply national defense because everyone can consume national defense whether they pay for it or not. The behavior of consumers in this situation is called **free riding** because individuals benefit from a good—in this case, national defense—without paying for it.
3. A *quasi-public good* is excludable but not rival. An example is a streaming service like Netflix. People who do not pay for a streaming service do not receive it, but one person watching it doesn't prevent other people from watching it. Another example is a toll road. Anyone who doesn't pay the toll doesn't get on the highway, but one person using the highway doesn't interfere with someone else using the highway (unless so many people are using the highway that it becomes congested).

Common resource A good that is rival but not excludable.

4. A **common resource** is rival but not excludable. Forestland in many poor countries is a common resource. If one person cuts down a tree, no one else can use that tree. But if no one has a property right to the forest, no one can be excluded from using it. As we will discuss in more detail later in this section, people often overuse common resources.

We analyzed the demand and supply for private goods in earlier chapters. For the remainder of this chapter, we focus on public goods and common resources. To determine the optimal quantity of a public good, we have to modify our usual demand and supply analysis to take into account the fact that a public good is both nonrival and nonexcludable.

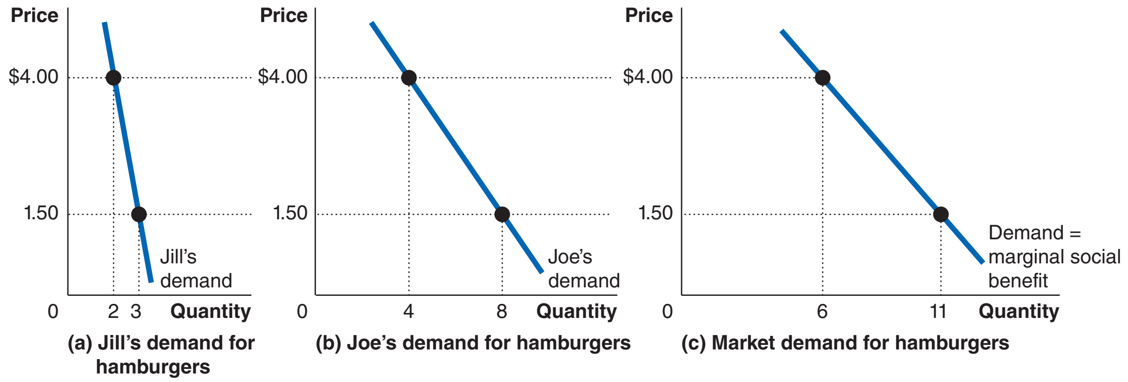
The Demand for a Public Good

We can determine the market demand curve for a good or service by adding up the quantity of the good demanded by each consumer at each price. To keep things simple, let's consider the case of a market with only two consumers. Figure 5.11 shows that the market demand curve for hamburgers depends on the individual demand curves of Jill and Joe:

- At a price of \$4.00, Jill demands 2 hamburgers per week, and Joe demands 4. Adding horizontally, the combination of a price of \$4.00 per hamburger and a quantity demanded of 6 hamburgers will be a point on the market demand curve for hamburgers.
- At a price of \$1.50, Jill demands 3 hamburgers per week, and Joe demands 8. Adding horizontally, the combination of a price of \$1.50 per hamburger and a quantity demanded of 11 hamburgers will be another point on the market demand curve.

A consumer's demand curve for a good represents the marginal benefit the consumer receives from the good, so when we add together the consumers' demand curves, we have not only the market demand curve but also the marginal social benefit curve for this good, assuming that there is no externality in consumption.

How can we find the demand curve, or marginal social benefit curve, for a public good? Once again, for simplicity, assume that Jill and Joe are the only consumers. Unlike



(a) Jill's demand for hamburgers

(b) Joe's demand for hamburgers

(c) Market demand for hamburgers

Figure 5.11 **Constructing the Market Demand Curve for a Private Good**

The market demand curve for private goods is determined by adding horizontally the quantity of the good demanded at each price by each consumer. For instance, in panel (a), Jill demands 2 hamburgers when the price is $4.00, and in panel (b), Joe demands 4 hamburgers when the price is $4.00. So, a quantity of 6 hamburgers and a price of $4.00 is a point on the market demand curve in panel (c).

with a private good, where Jill and Joe can end up consuming different quantities, with a public good, they will consume *the same quantity*. Suppose that Jill owns a service station on an isolated rural road, and Joe owns a car dealership next door. These are the only two businesses around for miles. Both Jill and Joe are afraid that unless they hire a security guard at night, their businesses may be burgled. Like national defense, the services of a security guard are in this case a public good: Once hired, the guard will be able to protect both businesses, so the good is nonrival. It also will be impossible to exclude either business from being protected, so the good is nonexcludable.

To arrive at a demand curve for a public good, we don't add quantities at each price, as with a private good. Instead, we add the price each consumer is willing to pay for each quantity of the public good. This value represents the total dollar amount consumers as a group would be willing to pay for that quantity of the public good. In other words, to find the demand curve, or marginal social benefit curve, for a private good, we add the demand curves of individual consumers horizontally; for public goods, we add individual demand curves vertically. Figure 5.12 shows how the marginal social benefit curve for security guard services depends on the individual demand curves of Jill and Joe. The figure shows that:

- Jill is willing to pay $8 per hour for the guard to provide 10 hours of protection per night. Joe would suffer a greater loss from a burglary, so he is willing to pay $10 per hour for the same amount of protection. Adding the dollar amount that each is willing to pay gives us a price of $18 per hour and a quantity of 10 hours as a point on the marginal social benefit curve for security guard services.
- Jill is willing to spend $4 per hour for 15 hours of guard services, and Joe is willing to pay $5. So a price of $9 per hour and a quantity of 15 hours is another point on the marginal social benefit curve for security guard services.

The Optimal Quantity of a Public Good

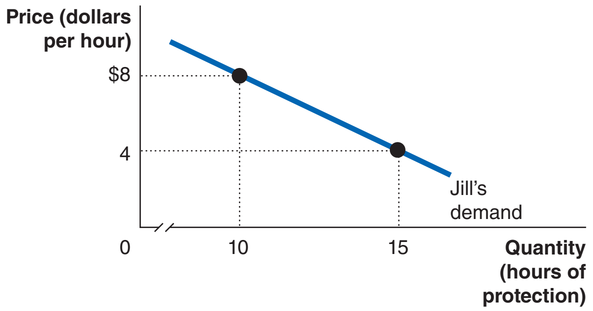
We know that to achieve economic efficiency, a good or service should be produced up to the point where the sum of consumer surplus and producer surplus is maximized, or, alternatively, where the marginal social cost equals the marginal social benefit. Therefore, the optimal quantity of security guard services—or any other public good—will occur where the marginal social benefit curve intersects the supply curve. As with private goods, in the absence of an externality in production, the supply curve represents the marginal social cost of supplying the good. Figure 5.13 shows that the optimal quantity of security guard services supplied is 15 hours, at a price of $9 per hour.

Will the market provide the economically efficient quantity of security guard services? One difficulty is that the individual preferences of consumers, as shown by their demand curves, are not revealed in this market. This difficulty does not arise with private

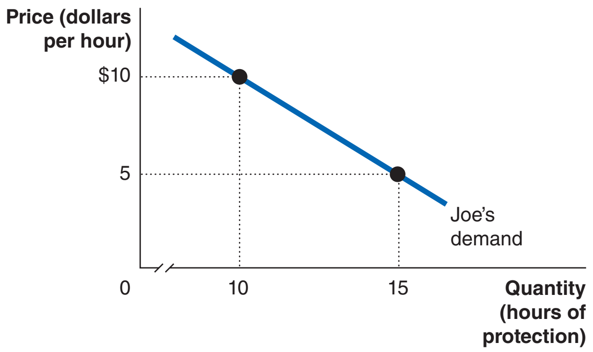
Figure 5.12

Constructing the Demand Curve for a Public Good

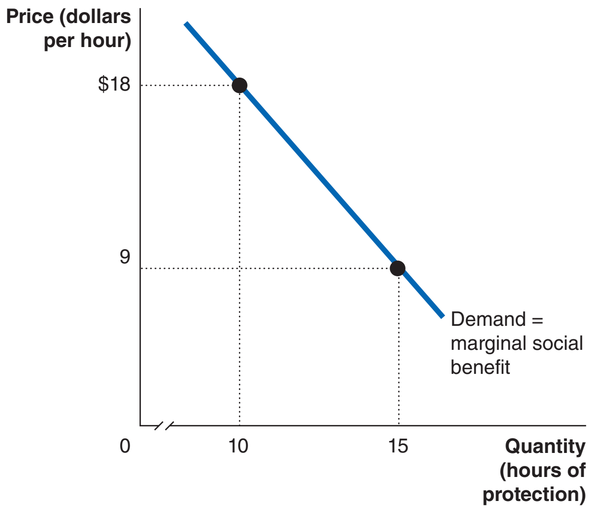
To find the demand curve for a public good, we add up the price at which each consumer is willing to purchase each quantity of the good. In panel (a), Jill is willing to pay $8 per hour for a security guard to provide 10 hours of protection. In panel (b), Joe is willing to pay $10 for that level of protection. Therefore, in panel (c), the price of $18 per hour and the quantity of 10 hours will be a point on the demand curve for security guard services.



(a) Jill's demand for security guard services



(b) Joe's demand for security guard services

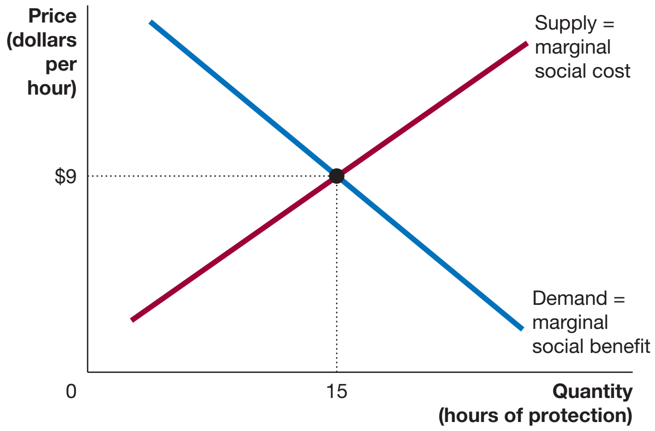


(c) Total demand for security guard services

Figure 5.13

The Optimal Quantity of a Public Good

The optimal quantity of a public good is produced where the sum of consumer surplus and producer surplus is maximized, which occurs where the demand curve intersects the supply curve. In this case, the optimal quantity of security guard services is 15 hours, at a price of $9 per hour.



goods because consumers must reveal their preferences in order to purchase private goods. If the market price of Big Macs is $4.00, Joe either reveals that he is willing to pay that much by buying it or he does without it. In our example, neither Jill nor Joe can be excluded from consuming the services provided by a security guard once either of them hires one, and, therefore, neither has an incentive to reveal her or his preferences. In this case with only two consumers, it is likely that private bargaining will result in an efficient quantity of the public good. This outcome is not likely for a public good—such as national defense—that is supplied by the government to millions of consumers and where the free-riding problem mentioned earlier is particularly serious.

Governments sometimes use *cost–benefit analysis* to determine what quantity of a public good should be supplied. For example, before building a dam on a river, the federal government will attempt to weigh the costs against the benefits. The costs include the opportunity cost of other projects the government cannot carry out if it builds the dam. The benefits include improved flood control and new recreational opportunities on the lake formed by the dam. However, for many public goods, including national defense, the government does not use a formal cost–benefit analysis. Instead, the quantity of national defense supplied is determined by a political process involving Congress and the president. Even here, of course, Congress and the president realize that trade-offs are involved: The more resources used for national defense, the fewer resources are available for other public or private goods.

Solved Problem 5.4

Determining the Optimal Level of Public Goods

Suppose, once again, that Jill and Joe run businesses that are next door to each other on an isolated road, and both need a security guard. Their demand schedules for security guard services are as follows:

Joe		Jill	
Price (dollars per hour)	Quantity (hours of protection)	Price (dollars per hour)	Quantity (hours of protection)
$20	0	$20	1
18	1	18	2
16	2	16	3
14	3	14	4
12	4	12	5
10	5	10	6
8	6	8	7
6	7	6	8
4	8	4	9
2	9	2	10

The supply schedule for security guard services is as follows:

Price (dollars per hour)	Quantity (hours of protection)
$8	1
10	2
12	3
14	4
16	5
18	6
20	7
22	8
24	9

a. Draw a graph that shows the optimal level of security guard services. Be sure to label the curves on the graph.

b. Briefly explain why 8 hours of security guard protection is not an optimal quantity.

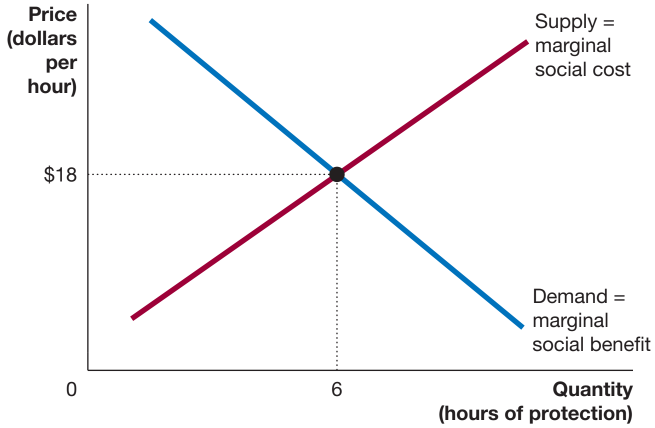
Solving the Problem

Step 1: **Review the chapter material.** This problem is about determining the optimal level of public goods, so you may want to review the section "The Optimal Quantity of a Public Good."

Step 2: **Begin by deriving the demand curve or marginal social benefit curve for security guard services.** To calculate the marginal social benefit of guard services, we need to add the prices that Jill and Joe are willing to pay at each quantity:

Demand, or Marginal Social Benefit	
Price (dollars per hour)	Quantity (hours of protection)
$38	1
34	2
30	3
26	4
22	5
18	6
14	7
10	8
6	9

Step 3: **Answer part (a) by plotting the demand (marginal social benefit) and supply (marginal social cost) curves.** The graph shows that the optimal level of security guard services is 6 hours.



Step 4: **Answer part (b) by explaining why 8 hours of security guard protection is not an optimal quantity.** For each hour beyond 6, the supply curve is above the demand curve. Therefore, the marginal social benefit received will be less than the marginal social cost of supplying these hours. This results in a deadweight loss and a reduction in economic surplus.

Your Turn: For more practice, do related problem 4.6 at the end of this chapter.

Common Resources

In England during the Middle Ages, each village had an area of pasture, known as a *commons*, on which any family in the village was allowed to graze its cows or sheep without charge. Of course, the grass one family's cow ate was not available for another family's cow, so consumption was rival. But every family in the village had the right to use the commons, so it was nonexcludable. Without some type of limit on usage, the commons would be overgrazed. To see why, consider the economic incentives facing a family that was thinking of buying another cow and grazing it on the commons. The family would gain the benefits from increased milk production, but adding another cow to the commons would create a negative externality by reducing the amount of grass available for the cows of other families. Because this family—and the other families in the village—did not take this negative externality into account when deciding whether to add another cow to the commons, too many cows would be added. The grass on the commons would eventually be depleted, and no family's cow would get enough to eat.

The Tragedy of the Commons The tendency for a common resource to be overused is called the **tragedy of the commons**. The forests in many poor countries are a modern example. When a family chops down a tree in a public forest, it takes into account the benefits of gaining firewood or wood for building, but it does not take into account the costs of deforestation. Haiti, for example, was once heavily forested. Today, perhaps half of the country's original forests have been cut down, primarily to be burned to create charcoal for heating and cooking. Because mountains in Haiti frequently lack tree roots to hold the soil, heavy rains now often lead to devastating floods.

Tragedy of the commons The tendency for a common resource to be overused.

Figure 5.14 shows that with a common resource such as wood from a forest, the efficient level of use, $Q_{\text{Efficient}}$, is determined by the intersection of the demand curve, which represents the marginal social benefit received by consumers, and S_2, which represents the marginal social cost of cutting the wood. As in our discussion of negative externalities, the social cost is equal to the private cost of cutting the wood plus the external cost. In this case, the external cost represents the fact that the more wood each person cuts, the less wood there is available for others and the greater the deforestation, which increases the chances of floods. Because each individual tree cutter ignores the external cost, the equilibrium quantity of wood cut is Q_{Actual}, which is greater than the efficient quantity. At the actual equilibrium level of output, there is a deadweight loss, equal to the area of the yellow triangle in Figure 5.14.

Is There a Way out of the Tragedy of the Commons? Notice that our discussion of the tragedy of the commons is very similar to our earlier discussion of negative externalities. The source of the tragedy of the commons is the same as the source of negative externalities: lack of clearly defined and enforced property rights. For instance, suppose that instead of being held as a collective resource, a piece of pastureland is owned by one person. That person will take into account the effect of adding another cow on the grass available to cows already using the pasture. As a result, the optimal number of cows will be placed on the pasture. Over the years, most of the commons lands in England were converted to private property. Most of the forestland in Haiti and other developing

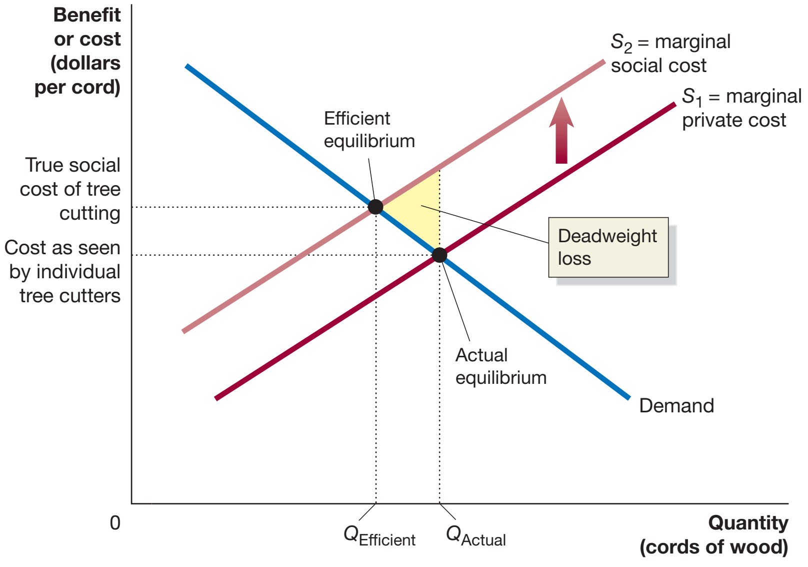


Figure 5.14

Overuse of a Common Resource

For a common resource such as wood from a forest, the efficient level of use, $Q_{\text{Efficient}}$, is determined by the intersection of the demand curve, which represents the marginal social benefit received by consumers, and S_2, which represents the marginal social cost of cutting the wood. Because each individual tree cutter ignores the external cost, the equilibrium quantity of wood cut is Q_{Actual}, which is greater than the efficient quantity. At the actual equilibrium level of output, there is a deadweight loss, equal to the area of the yellow triangle.

countries is actually the property of the government. The failure of the government to protect the forests against trespassers or convert them to private property is the key reason those forests are overused. In areas of Haiti where families have the legal right to harvest the trees they grow, deforestation has not been a problem.

In some situations, though, enforcing property rights is *not* feasible. An example is the oceans. Because no country owns the oceans beyond its own coastal waters, the fish and other resources of the ocean will remain a common resource. In situations in which enforcing property rights is not feasible, two types of solutions to the tragedy of the commons are possible:

1. **Norms and traditions.** If the geographic area concerned is limited and the number of people involved is small, access to the commons can be restricted through community norms and traditions. For instance, during the Middle Ages, each family had a traditional limit on the number of animals it could put on the common pasture. Although these traditions were not formal laws, communities used social pressure to enforce them.
2. **Laws.** If the geographic area or the number of people involved is large, legal restrictions on access to the commons are required. These restrictions can take several different forms, including taxes, quotas, and tradable permits. By setting a tax equal to the external cost, governments can ensure that the efficient quantity of a resource is used. In the United States, the government has used quotas to limit access to pools of oil that are beneath property owned by many different persons. The quotas specify the quantity of oil that can be pumped during a given period of time.

Continued from chapter opener

Economics in Your Life & Career

Advising a Senator about the "Best" Level of Pollution

At the beginning of this chapter, we asked you to think about what advice you would give as a policy aide to a U.S. senator on the "best" level of carbon emissions. Conceptually, this is a straightforward question to answer: The efficient level of carbon emissions is the level for which the marginal benefit of reducing carbon emissions exactly equals the marginal cost of reducing carbon emissions. In practice, however, this question is very difficult to answer. For example, scientists disagree about how much carbon emissions are contributing to climate change and what the damage from climate change will be. In addition, the cost of reducing carbon emissions depends on the method of reduction used. As a result, neither the marginal benefit curve nor the marginal cost curve for reducing carbon emissions is known with certainty. This uncertainty makes it difficult for policymakers to determine the economically efficient level of carbon emissions and is the source of much of the current debate. In any case, economists agree that the total cost of *completely* eliminating carbon emissions is much greater than the total benefit. So, at least you can provide the senator you work for with that conclusion!

Conclusion

We saw in Chapter 4 that government interventions in the economy, such as imposing price ceilings and price floors, can reduce economic efficiency. But in this chapter, we have seen that the government plays an important role in the economy when the absence of well-defined and enforceable property rights keeps the market from operating efficiently. For instance, because no one has a property right to clean air, in the absence of government intervention, firms will produce too great a quantity of goods and services that generate air pollution. Policy actions, such as a carbon tax, can contribute to slowing the pace of climate change. Significantly slowing temperature increases will likely require coordinating policy across many countries. Although nuclear fusion technology may eventually provide an inexpensive way of generating electricity, commercial applications are likely to be a decade or more away. Finally, we also saw that public goods are nonrival and nonexcludable, so the government often supplies them.

CHAPTER SUMMARY AND PROBLEMS

Key Terms

Coase theorem, p. 164
Command-and-control approach, p. 170
Common resource, p. 176
Excludability, p. 175
Externality, p. 156
Free riding, p. 176
Market failure, p. 159
Pigovian taxes and subsidies, p. 170
Private benefit, p. 157
Private cost, p. 157
Private good, p. 175
Property rights, p. 159
Public good, p. 176
Rivalry, p. 175
Social benefit, p. 157
Social cost, p. 157
Tragedy of the commons, p. 181
Transactions costs, p. 164

5.1 Externalities and Economic Efficiency

LEARNING OBJECTIVE: Identify examples of positive and negative externalities and use graphs to show how externalities affect economic efficiency.

Summary

An **externality** is a benefit or cost to parties who are not involved in a transaction. Pollution and other externalities in production cause a difference between the **private cost** borne by the producer of a good or service and the **social cost**, which includes any external cost, such as the cost of pollution. An externality in consumption causes a difference between the **private benefit** received by the consumer and the **social benefit**, which includes any external benefit. If externalities exist in production or consumption, the market will not produce the optimal level of a good or service. This outcome is referred to as **market failure**. Externalities arise when property rights do not exist or cannot be legally enforced. **Property rights** are the rights individuals or businesses have to the exclusive use of their property, including the right to buy or sell it.

Review Questions

1.1 What is an externality? Give an example of a positive externality and give an example of a negative externality.

1.2 When does the private cost of producing a good differ from the social cost? Give an example. When does the private benefit from consuming a good differ from the social benefit? Give an example.

1.3 What is economic efficiency? How do externalities affect the economic efficiency of a market equilibrium?

1.4 What is market failure? When is market failure likely to arise?

1.5 Briefly explain the relationship between property rights and the existence of externalities.

Problems and Applications

1.6 In 2017, Santa Barbara County, California decided to allow commercial farming of marijuana. Joan Esposito, who lives near greenhouses where the drug is grown, complained: "That smell is in the carpet. You can smell it on the towels." Realtor Gary Goldberg had to lower the selling price of a condo by $18,000 after a potential buyer complained about a "persistent skunky smell."

- **a.** What do the complaints from Esposito and Goldberg tell us about the likelihood that the economically efficient level of marijuana is being grown in Santa Barbara County? Briefly explain.
- **b.** Suppose a member of the Santa Barbara County Board of Supervisors responds to complaints like those from Esposito and Goldberg by proposing that the county outlaw commercial growing of marijuana. Would this ban be an economically efficient response to the complaints? Briefly explain.

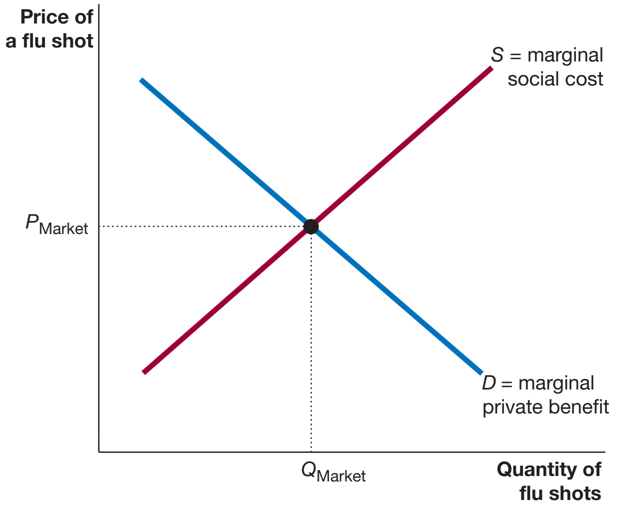
1.7 Yellowstone National Park is in bear country. The National Park Service, at its Yellowstone website, states the following about camping and hiking in bear country:

> Do not leave packs containing food unattended, even for a few minutes. Allowing a bear to obtain human food even once often results in the bear becoming aggressive about obtaining such food in the future. Aggressive bears present a threat to human safety and eventually must be destroyed or removed from the park. Please obey the law and do not allow bears or other wildlife to obtain human food.

What negative externality does obtaining human food pose for bears? What negative externality do bears obtaining human food pose for future campers and hikers?

1.8 Every year at the beginning of flu season, many people, including individuals who are elderly, get a flu shot to reduce their chances of contracting the flu. One result is that people who do *not* get a flu shot are less likely to contract the flu.

- **a.** What type of externality (negative or positive) arises from getting a flu shot?
- **b.** On the graph that follows, show the effects of this externality by drawing in and labeling any additional curves that are needed and by labeling the efficient quantity and the efficient price of flu shots. Label the area representing deadweight loss in this market.



1.9 In an opinion column written for the *Wall Street Journal*, Fred Krupp, president of the Environmental Defense Fund, observes that "in most of the world, there is no economic incentive for corporations to reduce pollution." What does the writer mean by "economic incentive"? Why might corporations lack an economic incentive to reduce pollution?

1.10 In a study at a large state university, students were randomly assigned roommates. Researchers found that, on average, males assigned to roommates who reported drinking alcohol in the year before entering college earned GPAs one-quarter point lower than those assigned to nondrinking roommates. For males who drank frequently before college, being assigned to a roommate who also drank frequently before college reduced their GPAs by two-thirds of a point. Draw a graph showing the price of alcohol and the quantity of alcohol consumption on college campuses. Include in the graph the demand for drinking and the private and social costs of drinking. Label any deadweight loss that arises in this market.

1.11 Tom and Jacob are college students. Each of them will probably get married later and have two or three children. Each knows that if he studies more in college, he'll get a better job and earn more money. Earning more will enable Tom and Jacob to spend more on their future families for things such as orthodontia, nice clothes, admission to expensive colleges, and travel. Tom thinks about the benefits to his potential children when he decides how much studying to do. Jacob doesn't.

a. What type of externality arises from studying?

b. Draw a graph showing this externality, contrasting the responses of Tom and Jacob. Who studies more? Who acts more efficiently? Briefly explain.

1.12 The chemical firm Bayer developed a weed killer called dicamba. Dicamba is particularly useful in killing weeds in fields planted with soybeans that have been engineered to be immune to the compound. Some farmers who plant soybeans that are not immune to dicamba complain that when the compound dries, it can be blown onto their fields, damaging their crops. The farmers who use dicamba argue that it reduces their cost of growing soybeans.

a. First, assume that dicamba causes no significant damage to the crops of farmers growing soybeans that are not immune to the compound. Use a demand and supply graph to show the effect of dicamba on the market for soybeans.

b. Now assume that dicamba causes damage to the crops of farmers growing soybeans that are not immune to the compound. On your graph from part (a), show the effect of using dicamba. Be sure to carefully label all curves and all equilibrium points.

c. In your graph in part (b), what has happened to the efficient level of output and the efficient price in the market for soybeans compared with the situation before dicamba was introduced? Can you be certain that the efficient level of output and the efficient price have risen or fallen as a result of farmers using dicamba? Briefly explain.

1.13 An article in the *Economist* on externalities recommended that policymakers consider what "institutions and laws" could "fix things."

a. In discussing externalities, what does "fix things" mean?

b. What do laws and institutions have to do with externalities?

5.2 Private Solutions to Externalities: The Coase Theorem

LEARNING OBJECTIVE: Discuss the Coase theorem and explain how private bargaining can lead to economic efficiency in a market with an externality.

Summary

Externalities and market failures result from incomplete property rights or from the difficulty of enforcing property rights in certain situations. When an externality exists and the efficient quantity of a good is not being produced, the total cost of reducing the externality is usually less than the total benefit. **Transactions costs** are the costs in time and other resources that parties incur in the process of agreeing to and carrying out an exchange of goods or services. According to the **Coase theorem**, if these costs are low, private bargaining will result in an efficient solution to the problem of externalities.

Review Questions

2.1 What do economists mean by "an economically efficient level of pollution"?

2.2 What is the Coase theorem? Why do the parties involved in an externality have an incentive to reach an efficient solution?

2.3 What are transactions costs? When are we likely to see private solutions to the problem of externalities?

Problems and Applications

2.4 **[Related to the Economics in Your Life & Career]** Is it ever possible for an *increase* in pollution to make society better off? Briefly explain, using a graph like Figure 5.3.

2.5 Look again at problem 1.6. Use the Coase theorem to briefly evaluate Gary Goldberg's decision to lower the price of a condo by $18,000.

2.6 Discuss the factors that determine the marginal cost of reducing crime. Discuss the factors that determine the marginal benefit of reducing crime. Would it be economically efficient to reduce the amount of crime to zero? Briefly explain.

2.7 In discussing the reduction of air pollution in the developing world, Richard Fuller of the Pure Earth, an environmental organization, observed, "It's the 90/10 rule. To do 90 percent of the work only costs 10 percent of the money. It's the last 10 percent of the cleanup that costs 90 percent of the money." Why should it be any more costly to clean up the last 10 percent of polluted air than to clean up the first 90 percent? What trade-offs would be involved in cleaning up the final 10 percent?

2.8 **[Related to the Apply the Concept "The Clean Air Act: How a Government Policy Improved Health"]** Under the Clean Air Act, the Environmental Protection Agency (EPA) regulates ozone emissions. Mark Perry, an economist at the University of Michigan–Flint, notes in an opinion column: "Ground-level ozone, a major component of smog, causes premature deaths among people with lung and respiratory ailments like asthma." And he says that according to the Clean Air Act, "the EPA is not allowed to factor in the cost of environmental compliance when tightening its ozone standard."

a. Is the economically efficient level of ozone emissions zero? Briefly explain.

b. Is it likely that under the Clean Air Act, as it is currently written, the United States will achieve the economically efficient level of ozone emissions? Briefly explain.

2.9 **[Related to the Don't Let This Happen to You]** Mabel is an advocate for a "zero tolerance" policy regarding all illegal street drugs, including cocaine and heroin. Mabel has witnessed high crime and violence in her neighborhood and believes that only if police arrest and prosecute anyone who sells or uses illegal drugs will she and her neighbors and their children live without fear. Is the policy that Mabel endorses economically efficient? Briefly explain.

2.10 **[Related to the Apply the Concept "How Can You Defend Your Knees on a Plane Flight?"]** Ira Goldman invented the Knee Defender, which prevents the airline seat in front of a passenger from reclining. He argues that airlines have sold the space between two seats to the person occupying the seat but also to the person in the seat in front of that seat by allowing the occupant to recline the seat. Assume that Goldman is correct. According to the Coase theorem, does this airline policy make it impossible for passengers to achieve an economically efficient outcome with respect to the issue of reclining seats? Briefly explain.

2.11 **[Related to the Apply the Concept "How Can You Defend Your Knees on a Plane Flight?"]** Commuter trains often have "quiet cars," in which passengers are expected not to play music or engage in loud conversations. An opinion poll that asked whether airline passengers reclined their seats found that "half of respondents recline half the time or more, half of respondents do it once in a while or never." Consider two possible ways that airlines might deal with the externality caused by reclining a seat:

i. Make all seats so that they cannot be reclined.

ii. Have a "no reclining" section on each flight (similar to the quiet cars on commuter trains), in which passengers would not be allowed to recline their seats.

Would either of these changes be likely to result in an economically efficient outcome? Briefly explain.

5.3 Government Policies to Deal with Externalities

LEARNING OBJECTIVE: Analyze government policies to achieve economic efficiency in a market with an externality.

Summary

When private solutions to externalities are unworkable, the government sometimes intervenes. One way to deal with a negative externality in production is to impose a tax equal to the cost of the externality. The tax causes the producer of the good to internalize the externality. The government can deal with a positive externality in consumption by giving consumers a subsidy, or payment, equal to the value of the externality. Government taxes and subsidies intended to bring about an efficient level of output in the presence of externalities are called **Pigovian taxes and subsidies**. Although the federal government has sometimes used subsidies and taxes to deal with externalities, in dealing with pollution, it has more often used a command-and-control approach. With a **command-and-control approach**, the government imposes quantitative limits on the amount of pollution allowed or requires firms to install specific pollution control devices. Direct pollution controls of this type are not economically efficient, however. As a result, economists generally prefer using market-based policies to reduce pollution.

Review Questions

3.1 What is a Pigovian tax? How large should a Pigovian tax be to achieve efficiency?

3.2 What does it mean for a producer or consumer to internalize an externality? What would cause a producer or consumer to internalize an externality?

3.3 Why do many economists prefer market-based policies to the command-and-control approach to pollution?

Problems and Applications

3.4 An article in the *Wall Street Journal* discusses certain types of taxes: "They are called 'Pigovian' taxes, after the economist Arthur Pigou, who proposed using taxes to discourage undesirable behavior."

a. Give an example of a Pigovian tax.

b. Why might the government want to use a tax to discourage undesirable behavior rather than just ban the behavior?

3.5 An article in the *Economist* describes Pigou's view of taxes and subsidies in situations where there is an externality in a market: "These measures would use prices to restore market perfection and avoid strangling people with red tape."

a. What does the author mean by "restore market perfection"?

b. What is "red tape"? In what sense do Pigovian subsidies and taxes "avoid strangling people with red tape"?

3.6 Many antibiotics are no longer effective in eliminating infections because bacteria have evolved to become resistant to them. The more often an antibiotic is prescribed, the more quickly it becomes ineffective in curing bacterial infections. Some bacteria are now resistant to all but one or two existing antibiotics. An article in the *Wall Street Journal* notes, "In the U.S. alone, at least two million illnesses and 23,000 deaths can be attributed each year to antibiotic-resistant bacteria."

a. Are there externalities involved in the market for antibiotics that would require a government subsidy to achieve an economically efficient outcome? Briefly explain.

b. Many people have health insurance that covers the majority of the cost of their prescription drugs, including antibiotics. Does this fact make the case for a government subsidy of the production of antibiotics stronger or weaker? Briefly explain.

3.7 A column in the *New York Times* has the headline "Should We Tax People for Being Annoying?"

a. Do annoying people cause a negative externality? Should they be taxed? Do crying babies on a bus or plane cause a negative externality? Should the babies (or their parents) be taxed?

b. Do people who plant flowers and otherwise have beautiful gardens visible from the street cause a positive externality? Should these people receive a government subsidy?

c. Should every negative externality be taxed? Should every positive externality be subsidized? How might the government decide whether using Pigovian taxes and subsidies is appropriate?

3.8 **[Related to the Apply the Concept "Should the Government Tax Cigarettes and Soda?"]** Eric Finkelstein, an economist at Duke University, argued that the external costs from being obese are larger than the external costs from smoking because "the mortality effect for obesity is much smaller than it is for smoking and the costs start much earlier in life."

a. What does Finkelstein mean by the "mortality effect"? Why would the mortality effect of obesity being smaller than the mortality effect of smoking result in obesity having a larger external cost?

b. Tobacco taxes have been more politically popular than taxes on soda. Why might the general public be more willing to support cigarette taxes than soda taxes?

3.9 **[Related to Solved Problem 5.3]** Look again at *Solved Problem 5.3*. According to news reports at the time, some people doubted that they actually were at risk of contracting Covid–19 from dining indoors in a restaurant. Suppose that the doubts are reflected in demand curve D_1 that we drew in the graph in the answer to part (a) of the *Solved Problem*. Now suppose that dining indoors at a restaurant during the pandemic did increase a diner's chances of contracting Covid–19 and that every diner was aware of this fact. Refer to the graph from the answer to part (a) of the *Solved Problem* and briefly explain how that awareness would affect each of the following. Draw a new graph to illustrate your answer.

a. The demand curve, D_1

b. The demand curve, D_2

c. Q_{Market}

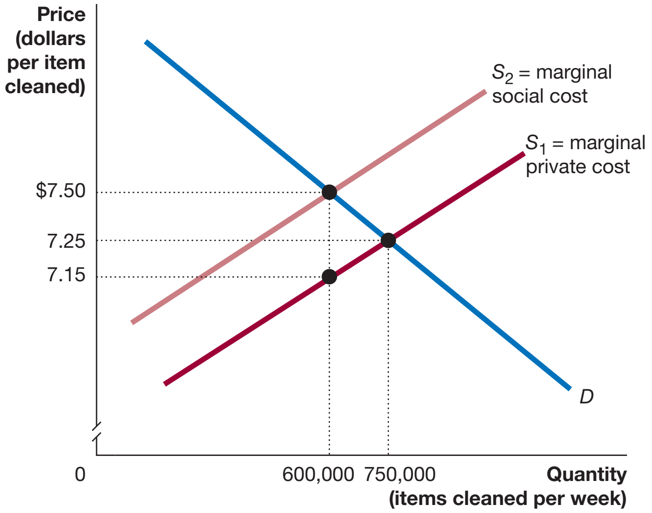
d. $Q_{\text{Efficient}}$

e. P_{Market}

f. $P_{\text{Efficient}}$

g. Size of the deadweight loss

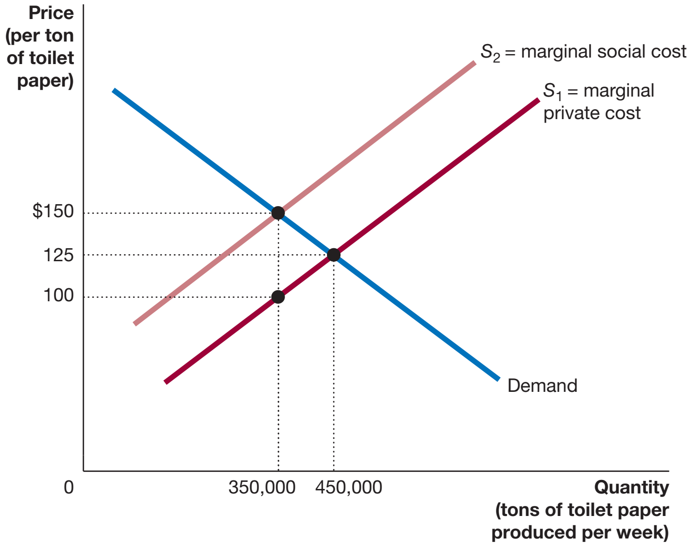
3.10 **[Related to Solved Problem 5.3]** The fumes from dry cleaners can contribute to air pollution. Suppose the following graph illustrates the situation in the dry cleaning market.



a. Explain how a government can use a tax on dry cleaning to bring about the efficient level of production. What should the value of the tax be in this case?

b. How large is the deadweight loss (in dollars) from excessive dry cleaning, according to the graph?

3.11 **[Related to Solved Problem 5.3]** Companies that produce toilet paper bleach the paper to make it white. Some paper plants discharge the bleach into rivers and lakes, causing substantial environmental damage. Suppose the following graph illustrates the situation in the toilet paper market.



Explain how the federal government can use a tax on toilet paper to bring about the efficient level of production. What should the value of the tax be in this case?

3.12 **[Related to the Chapter Opener]** According to a *Wall Street Journal* article on power company NextEra and its CEO James Robo, "When Mr. Robo took over in 2002, the wind industry was small and mostly unprofitable. Wind represented 0.3% of electricity generated [in the United States], according to federal statistics." In 2022, wind turbines generated about 9.9 percent of electricity in the United States. The article also notes that a key factor helping NextEra to grow was federal subsidies of electricity generated by wind turbines. In 2022, the Biden administration set a goal of reducing the cost of generating electricity with offshore wind farms by 70 percent by 2035.

- **a.** Why would the federal government subsidize electricity generated in this way?
- **b.** What alternative policy might the federal government have used to reach the same goal?

3.13 **[Related to the Apply the Concept "Does the United States Need a Green New Deal?"]** A columnist for the *Wall Street Journal* wrote, "The premise behind the Green New Deal is right." But he also wrote that "the Green New Deal seems engineered to be as expensive as possible" and argued that climate change policy should focus on "market mechanisms that incentivize carbon reduction at the lowest price."

- **a.** What is the premise behind the Green New Deal?
- **b.** Why might implementing the Green New Deal be expensive?
- **c.** What did the columnist mean by "market mechanisms that incentivize carbon reduction"? How would a market-based approach differ from the approach of the sponsors of the Green New Deal?

3.14 **[Related to the Apply the Concept "Does the United States Need a Green New Deal?"]** An editorial in the *New York Times* argued that "the single best way to slow global warming is to put a price on greenhouse gas emissions from fossil fuels."

- **a.** How would it be possible to put a price on greenhouse gas emissions? Don't utilities and other firms that emit greenhouse gases automatically pay a price, without the government intervening? Briefly explain.
- **b.** How would putting a price on greenhouse gas emissions slow global warming?

3.15 **[Related to the Apply the Concept "Does the United States Need a Green New Deal?"]** The American Petroleum Institute (API) is a lobbying group for the oil industry. The API's *Climate Action Framework* endorses carbon pricing: "Rather than a patchwork of federal and state regulations and mandates that could ineffectively address the climate challenge, an economywide government carbon price policy is the most impactful and transparent way to achieve meaningful progress." Why might the API endorse a government carbon pricing policy rather than regulations and mandates to deal with the externalities from carbon emissions?

3.16 **[Related to the Apply the Concept "Does the United States Need a Green New Deal?"]** NextEra Energy has been helped in its expansion by the fact that prices of renewable energy equipment, such as wind turbines and silicon solar modules that are used in generating electricity from solar power, have been falling since 2010.

- **a.** Draw a graph showing the market for coal used in generating electric power as it was in 2010, before the sharp declines in the prices of renewable energy equipment. Be sure to include on your graph the effects of the externality from burning coal, the economically efficient quantity of coal, and the market quantity of coal.
- **b.** On your graph from part (a), show the effect on the market for coal of the falling prices of renewable energy equipment. Does the effect make the market quantity of coal closer to or further away from the economically efficient quantity of coal? Briefly explain.

5.4 Four Categories of Goods

LEARNING OBJECTIVE: Categorize goods on the basis of whether they are rival or excludable and use graphs to illustrate the efficient quantities of public goods and common resources.

Summary

There are four categories of goods: private goods, public goods, quasi-public goods, and common resources. A **private good** is both rival and excludable. **Rivalry** means that when one person consumes a unit of a good, no one else can consume that unit. **Excludability** means that anyone who does not pay for a good cannot consume it. A **public good** is both nonrival and nonexcludable. Private firms are usually not willing to supply public goods because of free riding. **Free riding** involves benefiting from a good without paying for it. *Quasi-public goods* are excludable but not rival. **Common resources** are rival but not excludable. The **tragedy of the commons** refers to the tendency for a common resource to be overused. The tragedy of the commons results from a lack of clearly defined and enforced property rights. We find the market demand curve for a private good by adding the quantity of the good demanded by each consumer at each price. We find the demand curve for a public good by adding vertically the price each consumer would be willing to pay for each quantity of the good. The optimal quantity of a public good occurs where the demand curve intersects the curve representing the marginal cost of supplying the good.

Review Questions

4.1 Define *rivalry* and *excludability* and use these terms to discuss the four categories of goods.

4.2 What is free riding? How is free riding related to the need for public goods?

4.3 What is the tragedy of the commons? Give two examples. How can the tragedy of the commons be avoided?

Problems and Applications

4.4 The merry-go-round in Ross Park, a public park in Binghamton, New York, was first installed in 1920 and has been periodically refurbished by the city in the years since then. There is no entry fee to visit the park or to ride the merry-go-round. Is the merry-go-round a public good? Briefly explain.

4.5 In writing about the increased popularity of national parks in the United States, such as Yosemite, Yellowstone, and the Grand Canyon, environmental economist Margaret Walls wrote:

> When one person's visit to a park doesn't appreciably diminish the experience for others, the fee to use the park should be zero. That doesn't apply when the public good starts to experience congestion problems . . . the Park Service should . . . [charge] a significantly higher fee at the most popular parks during the summer months.

Are Yosemite and other national parks public goods? Briefly explain.

4.6 **[Related to Solved Problem 5.4]** Suppose that Joe and Jill are the only two people in the small town of Andover. Andover has land available to build a park of no more than 9 acres. Joe and Jill's demand schedules for the park are as follows:

Joe	
Price per Acre	**Number of Acres**
$10	0
9	1
8	2
7	3
6	4
5	5
4	6
3	7
2	8
1	9

Jill	
Price per Acre	**Number of Acres**
$15	0
14	1
13	2
12	3
11	4
10	5
9	6
8	7
7	8
6	9

The supply schedule is as follows:

Price per Acre	Number of Acres
$11	1
13	2
15	3
17	4
19	5
21	6
23	7
25	8
27	9

a. Draw a graph showing the optimal size of the park. Be sure to label the curves on the graph.

b. Briefly explain why a park of 2 acres is not optimal.

4.7 As readers of Herman Melville's 1851 novel *Moby Dick* know, at one time oil made from whale blubber was an important source of energy that was widely used by households and firms in oil lamps. Other sources of energy replaced whale oil in the second half of the nineteenth century, and today many Americans consider whales only as a source of entertainment on visits to aquariums and whale watching excursions. But some species of whales—including baleen and gray whales—are in danger of extinction. The U.S. Department of Agriculture estimates that more than 9 billion chickens are raised for food annually. Chickens, unlike whales, are not threatened with extinction. Briefly explain why.

4.8 In the African country of Zimbabwe, farmers often live close to elephant herds in the Hwange National Park. The elephants can damage crops and sometimes cause injuries to people. According to Catherine Semcer of the Property and Environment Research Center, in 2014:

> The U.S. government used its authority under the Endangered Species Act to impose a temporary ban on imports of elephant hunting trophies from Zimbabwe. . . . African conservationists greeted the news with concern. They feared the U.S. policy would threaten the very elephants it intended to conserve, as key economic incentives for conservation disappeared.

Semcer notes that "rural communities receive half of revenues from trophy-hunting operations, as well as access to meat from animals killed by foreign hunters."

a. Are elephants in Zimbabwe a public good? Briefly explain.

b. Why might a ban on hunting elephants actually reduce their numbers?

4.9 Nancy Folbre, an economist at the University of Massachusetts Amherst, argued, "We must take responsibility for governing the commons—not just the quaint old-fashioned village green, but things that cannot easily be privatized—[such as] clean air." Do you agree that clean air is like a common pasture in England in the Middle Ages? Briefly explain.

4.10 Some children who are vaccinated against measles would still contract the disease if they were exposed to it. But if most children are vaccinated against measles, the population achieves "herd immunity," which means that there are so few cases of the disease that even children for whom vaccinations are ineffective are unlikely to contract the disease. Suppose someone says: "If most children are getting vaccinated, why does it matter if I don't get my children vaccinated?"

- **a.** Is "herd immunity" a public good?
- **b.** What does "free riding" mean? Is the person asking the question attempting to free ride? How might free riding affect the rate at which people vaccinate their children?
- **c.** Given your answer to part (b), why does every U.S. state require that children be vaccinated against measles before enrolling in kindergarten?

4.11 Put each of the following goods or services into one of the categories shown in Figure 5.10. That is, categorize them as private goods, public goods, quasi-public goods, or common resources.

- **a.** A streaming broadcast of the National Basketball Association's finals
- **b.** Home mail delivery
- **c.** Education in a public school
- **d.** Education in a private school
- **e.** Hiking in a park surrounded by a fence
- **f.** Hiking in a park not surrounded by a fence
- **g.** An apple

4.12 William Easterly, in *The White Man's Burden*, shared the following account by Princeton University Professor Leonard Wantchekon of how Professor Wantchekon's village in Benin, Africa, managed the local fishing pond when he was growing up:

> To open the fishing season, elders performed ritual tests at Amlé, a lake fifteen kilometers from the village. If the fish were large enough, fishing was allowed for two or three days. If they were too small, all fishing was forbidden, and anyone who secretly fished the lake at this time was outcast, excluded from the formal and informal groups that formed the village's social structure. Those who committed this breach of trust were often shunned by the whole community; no one would speak to the offender, or even acknowledge his existence for a year or more.

What economic problem were the village elders trying to prevent? Do you think their solution was effective?

Critical Thinking Exercises

CT5.1 You and a friend are discussing the role of government in the economy. Her viewpoint is that governments should not interfere with the operation of markets. After reading this chapter and Chapter 4, could you convince her to change her viewpoint? Write a paragraph, in your own words, giving the argument you would make to your friend. Be sure to include a graph to illustrate your argument.

CT5.2 The chapter describes an "efficient level of pollution." Going beyond knowing how to answer a test question on this topic, did the concepts in this chapter convince you there is an efficient level of pollution? Briefly explain in your own words.

6

Elasticity: The Responsiveness of Demand and Supply

Do Soda Taxes Work?

YOUR GROCERY BILL IS ABOUT TO GO WAY UP!
No Philly Grocery Tax!
No NEW TAXES
STOP taxing our working families.
BAD IDEA THEN, WORSE IDEA NOW, JUST VOTE NO
NO SODA TAX

Matt Rourke/AP Images

Governments impose taxes for two main reasons: (1) to discourage consumers from using products, like cigarettes, that can have negative health consequences, and (2) to raise revenue. A number of cities, including San Francisco, Chicago, and Philadelphia, have enacted taxes on sweetened beverages, such as soda and iced tea. Do such taxes work? The answer depends on what policy goals city governments are trying to achieve. A tax on soda can have positive effects on health because drinking sweetened beverages has been linked to health problems such as obesity and diabetes. Before San Francisco enacted a 2-cents-per-ounce tax on sweetened beverages, a member of the California state senate argued, "These drinks are undermining public health and helping explode health care costs and insurance rates for the taxpayer." A tax on soda also raises revenue for the city enacting it. For example, when Philadelphia imposed a tax of 1.5 cents per ounce on sweetened beverages, the mayor stated, "The purpose of the tax was to raise money for important needs," including funding prekindergarten classes.

Notice that these two purposes for enacting a soda tax can be at odds with each other. The tax revenue a city raises equals the tax per ounce of soda multiplied by the number of ounces of soda sold. For example, if the tax is 1.5 cents per ounce, and 6 billion ounces of soda are sold in the city that year, the tax will raise $90 million. Philadelphia hoped to raise $400 million from its soda tax over a five-year period. But because the tax raises the prices consumers pay for sweetened beverages, grocery stores and supermarkets will sell a smaller quantity of these beverages. The greater the decline in the quantity of soda demanded, the greater the health effect of the tax . . . but the less revenue the city will raise from the tax.

Supermarkets are also concerned with how much the quantity of soda demanded falls following a tax increase. Under pressure from supermarkets and soda manufacturers because sales of soda were declining, Chicago repealed its soda tax in 2017. The Philadelphia city council has considered repealing that city's soda tax because city supermarkets lost sales to supermarkets located in the suburbs. Several supermarkets located near the Philadelphia city limits have closed, with the owners citing the soda tax as the reason. But, as of late 2023, the tax was still in force.

All businesses know that if they increase prices they will sell less and if they cut prices they will sell more. Firms have a financial incentive to go beyond this basic point to determine *how much* their sales will change as they increase or decrease prices. Governments also have an incentive to determine how consumers will react if the price of a product such as soda rises following a tax increase. In this chapter, we will explore the important concept of *elasticity*, which allows economists to measure the responsiveness of the quantity demanded and the quantity supplied to changes in the market price. As we'll see, elasticity is one of the most useful concepts in economics.

Chapter Outline & Learning Objectives

6.1 The Price Elasticity of Demand and Its Measurement, page 192
Define and calculate the price elasticity of demand.

6.2 The Determinants of the Price Elasticity of Demand, page 199
List and explain the determinants of the price elasticity of demand.

6.3 The Relationship between Price Elasticity of Demand and Total Revenue, page 201
Explain the relationship between the price elasticity of demand and total revenue.

6.4 Other Demand Elasticities, page 206
Define and calculate the cross-price elasticity of demand and the income elasticity of demand and explain their determinants.

6.5 Using Elasticity to Analyze the Disappearing Family Farm, page 208
Use price elasticity and income elasticity to analyze economic issues.

6.6 The Price Elasticity of Supply and Its Measurement, page 210
Define price elasticity of supply and explain its determinants and how it is measured.

Economics in Your Life & Career

Would PepsiCo and One of Its Bottlers Prefer a National or Local Soda Tax?

In 2023, several city governments had taxes on soda, but there was no *national* soda tax. Suppose that Congress and the president are considering enacting such a tax for the entire country. You are an economist working for PepsiCo, and the firm's managers ask you to evaluate the effect of the tax on the firm's sales of its sodas and sweetened energy drinks. In particular, the managers ask you to consider whether a national soda tax might be better than widespread local soda taxes (assuming that the national tax would replace the local taxes). Would your evaluation change if you were employed by a local Pepsi bottler rather than by PepsiCo? As you read this chapter, try to answer these questions. You can check your answers against those we provide at the end of this chapter.

Whether you manage a beverage distributor, a clothing store, or a service station, you need to know how an increase or a decrease in the price of your products will affect the quantity consumers are willing to buy. We know that cutting the price of a good increases the quantity demanded and that raising the price reduces the quantity demanded. But the critical question is: *How much* will the quantity demanded change as a result of a price increase or decrease? Economists use the concept of **elasticity** to measure how one economic variable—such as the quantity demanded—responds to changes in another economic variable—such as the price. For example, the responsiveness of the quantity demanded of a good to changes in its price is called the *price elasticity of demand*. As a business manager, knowing the price elasticity of demand allows you to compute the effect of a price change on the quantity demanded and determine the price that will maximize profit.

Elasticity A measure of how much one economic variable responds to changes in another economic variable.

In addition to a good's price, consumer income and the prices of related goods also affect the quantity of the good that consumers demand. As a manager, you can apply the concept of elasticity to measure the responsiveness of demand to these other variables. With many economic issues, we are also interested in the responsiveness of the quantity supplied of a good to changes in its price, which is called the *price elasticity of supply*.

In this chapter, we will see that elasticity is also an important concept for policymakers. For example, if the government wants to discourage smoking, it can raise the price of cigarettes by increasing the tax on them. If policymakers know the price elasticity of demand for cigarettes, they can calculate how many fewer packs of cigarettes smokers will demand at a higher price.

6.1 The Price Elasticity of Demand and Its Measurement

LEARNING OBJECTIVE: Define and calculate the price elasticity of demand.

We know from the law of demand that when the price of a product falls, the quantity of the product demanded increases. But the law of demand tells firms only that the demand curves for their products slope downward. It is more useful to have a measure of the *responsiveness* of the quantity demanded to a change in price. This measure is called the **price elasticity of demand**.

Price elasticity of demand The responsiveness of the quantity demanded to a change in price, measured by dividing the percentage change in the quantity demanded of a product by the percentage change in the product's price.

Measuring the Price Elasticity of Demand

We might measure the price elasticity of demand by using the slope of the demand curve because the slope tells us how much quantity changes as price changes, but this approach has a drawback: The measurement of slope is sensitive to the units chosen for quantity and price. For example, suppose a soda tax causes an increase in the price of soda of \$1 per 2-liter bottle, which decreases the quantity demanded from 10.2 million bottles to 10.1 million bottles per day. The change in quantity equals -0.1 million bottles, and the change in price equals \$1, so the slope is $-0.1/1 = -0.1$. But:

- If we measure price in cents, rather than in dollars, the slope is $-0.1/100 = -0.001$.
- If we measure price in dollars and bottles in thousands, instead of millions, the slope is $-100/1 = -100$.
- If we measure price in cents and bottles in thousands, the slope is $-100/100 = -1$.

Clearly, the value we compute for the slope can change dramatically, depending on the units we use for quantity and price.

To avoid this confusion over units, economists use *percentage changes* when measuring the price elasticity of demand. Percentage changes are not dependent on units of measurement. (For a review of calculating percentage changes, see the appendix to Chapter 1.) No matter what units we use to measure the quantity of soda, 10 percent more soda is 10 percent more soda. Therefore, the price elasticity of demand is measured by dividing the percentage change in the quantity demanded by the percentage change in the product's price. Or:

$$\text{Price elasticity of demand} = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}}.$$

It's important to remember that *the price elasticity of demand is not the same as the slope of the demand curve*.

If we calculate the price elasticity of demand for a price cut, the percentage change in price will be negative, and the percentage change in quantity demanded will be positive. Similarly, if we calculate the price elasticity of demand for a price increase, the percentage change in price will be positive, and the percentage change in quantity demanded will be negative. Therefore, the price elasticity of demand is always negative. In comparing elasticities, though, we are usually interested in their relative size. So, we often drop the minus sign and compare their *absolute values*. For example, although -3 is actually a smaller number than -2, we say that a price elasticity of -3 is larger than a price elasticity of -2 because the absolute value of -3 is greater than the absolute value of -2.

Elastic Demand and Inelastic Demand

If the quantity demanded is very responsive to changes in price, the percentage change in quantity demanded will be *greater* than the percentage change in price, and the price elasticity of demand will be greater than 1 in absolute value. In this case, demand is **elastic**. For example, if a 10 percent decrease in the price of bagels results in a 20 percent increase in the quantity of bagels demanded, then:

Elastic demand The case where the percentage change in quantity demanded is *greater* than the percentage change in price, so the price elasticity is *greater* than 1 in absolute value.

$$\text{Price elasticity of demand} = \frac{20\%}{-10\%} = -2,$$

and we can conclude that the demand for bagels is elastic.

When the quantity demanded is not very responsive to price, however, the percentage change in quantity demanded will be *less* than the percentage change in price, and the price elasticity of demand will be less than 1 in absolute value. In this case, demand is **inelastic**. For example, if a 10 percent decrease in the price of wheat results in a 5 percent increase in the quantity of wheat demanded, then:

Inelastic demand The case where the percentage change in quantity demanded is *less* than the percentage change in price, so the price elasticity is *less* than 1 in absolute value.

$$\text{Price elasticity of demand} = \frac{5\%}{-10\%} = -0.5,$$

and we can conclude that the demand for wheat is inelastic.

In the special case where the percentage change in quantity demanded is equal to the percentage change in price, the price elasticity of demand equals -1 (or 1 in absolute value). In this case, demand is **unit elastic**.

Unit-elastic demand The case where the percentage change in quantity demanded is *equal to* the percentage change in price, so the price elasticity is equal to 1 in absolute value.

An Example of Calculating Price Elasticities

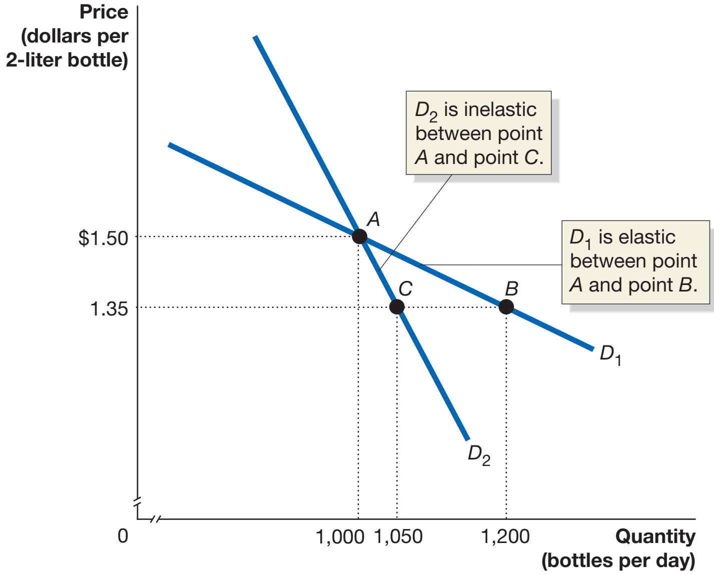
Suppose you own a grocery store, and you are trying to decide whether to cut the price of a 2-liter bottle of Coca-Cola. You are currently at point *A* in Figure 6.1, selling 1,000 bottles per day at a price of \$1.50 per bottle. How many more bottles you will sell by cutting the price to \$1.35 depends on the price elasticity of demand for Coca-Cola at your grocery store. Let's consider two possibilities: If D_1 is the demand curve for Coca-Cola at your store, your sales will increase to 1,200 bottles per day, point *B*. But if D_2 is your demand curve, your sales will increase only to 1,050 bottles per day, point *C*. We might expect—correctly, as we will see—that between these points, demand curve D_1 is *elastic* and demand curve D_2 is *inelastic*.

To confirm that D_1 is elastic between these points and that D_2 is inelastic, we need to calculate the price elasticity of demand for each curve. In calculating price elasticity between two points on a demand curve, though, we face a problem because we get a different value for price increases than for price decreases. Suppose we calculate the price

Figure 6.1

Elastic and Inelastic Demand

Along D_1, cutting the price from \$1.50 to \$1.35 increases the number of bottles demanded from 1,000 to 1,200 per day. Because the percentage change in quantity demanded is greater than the percentage change in price (in absolute value), demand is elastic between point *A* and point *B*. Along D_2, cutting the price from \$1.50 to \$1.35 increases the number of bottles demanded only from 1,000 to 1,050 per day. Because the percentage change in quantity demanded is smaller than the percentage change in price (in absolute value), demand is inelastic between point *A* and point *C*.



elasticity for D_1 as the price is cut from \$1.50 to \$1.35. This 10 percent price cut increases the quantity demanded from 1,000 bottles to 1,200 bottles, or by 20 percent. Therefore, the price elasticity of demand between points *A* and *B* is $20\%/-10\% = -2.0$.

Now let's calculate the price elasticity for D_1 as the price is *increased* from \$1.35 to \$1.50. This 11.1 percent price increase causes a decrease in the quantity demanded from 1,200 bottles to 1,000 bottles, or a decrease of 16.7 percent. Now our measure of the price elasticity of demand between points *A* and *B* is $-16.7\%/11.1\% = -1.5$. It can be confusing to have different values for the price elasticity of demand between the same two points on the same demand curve. As we will see in the next section, economists use a formula that allows them to avoid this confusion when calculating elasticities.

The Midpoint Formula

We can use the *midpoint formula* to ensure that we have only one value of the price elasticity of demand between the same two points on a demand curve. The midpoint formula uses the *average* of the initial and final quantities and the initial and final prices. If Q_1 and P_1 are the initial quantity and price, and Q_2 and P_2 are the final quantity and price, the midpoint formula is:

$$\text{Price elasticity of demand} = \frac{(Q_2 - Q_1)}{\left(\dfrac{Q_1 + Q_2}{2}\right)} \div \frac{(P_2 - P_1)}{\left(\dfrac{P_1 + P_2}{2}\right)}.$$

The midpoint formula may seem challenging at first, but the numerator is just the change in quantity divided by the average of the initial and final quantities, and the denominator is just the change in price divided by the average of the initial and final prices.

Let's apply the formula to calculating the price elasticity of D_1 in Figure 6.1. Between point *A* and point *B* on D_1, the change in quantity is 200, and the average of the two quantities is 1,100. Therefore, there is an 18.2 percent change in quantity demanded. The change in price is $-\$0.15$, and the average of the two prices is \$1.425. Therefore, there is a -10.5 percent change in price. So, the price elasticity of demand is $18.2\%/-10.5\% = -1.7$. Notice these three results from calculating the price elasticity of demand using the midpoint formula:

1. As we suspected from examining Figure 6.1, demand curve D_1 is elastic between points A and *B*.
2. The value for the price elasticity calculated using the midpoint formula is between the two values we calculated above.

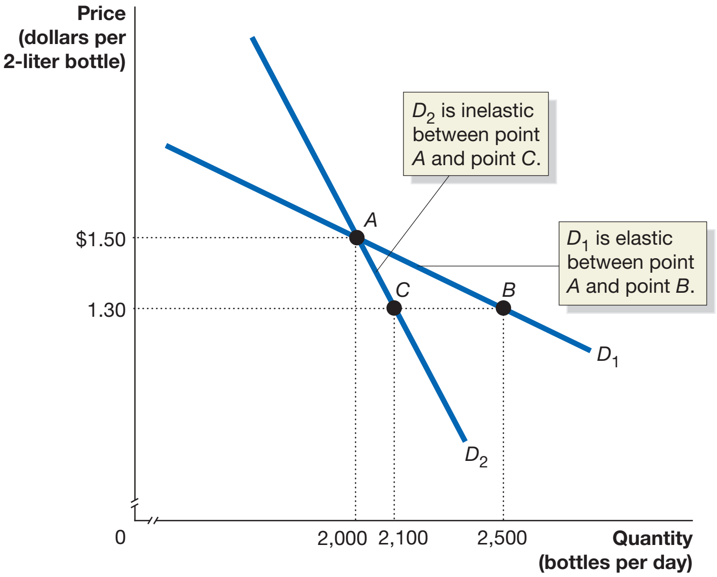
3. The midpoint formula will give us the same value whether we are moving from the higher price to the lower price or from the lower price to the higher price.

We can also use the midpoint formula to calculate the elasticity of demand between point *A* and point *C* on D_2. In this case, there is a 4.9 percent change in quantity and a −10.5 percent change in price. So, the elasticity of demand is 4.9%/−10.5% = −0.5. Once again, as we suspected, demand curve D_2 is price inelastic between points *A* and *C*.

Solved Problem 6.1

Calculating the Price Elasticity of Demand

Suppose you own a grocery store, and you are currently selling Coca-Cola for $1.50 per 2-liter bottle. At this price, you can sell 2,000 bottles per day. You are considering cutting the price to $1.30 to attract consumers who have been buying their Coca-Cola at competing grocery stores. The following graph shows two possible increases in the quantity of Coca-Cola sold as a result of your price cut. Use the information in the following graph to calculate the price elasticity between these two prices on each of the demand curves. Use the midpoint formula in your calculations. State whether each demand curve is elastic or inelastic between these two prices.



Solving the Problem

Step 1: **Review the chapter material.** This problem involves calculating the price elasticity of demand, so you may want to review the material in the section "The Midpoint Formula."

Step 2: **To begin using the midpoint formula, calculate the average quantity and the average price for demand curve D_1.**

$$\text{Average quantity} = \frac{2{,}000 + 2{,}500}{2} = 2{,}250$$

$$\text{Average price} = \frac{\$1.50 + \$1.30}{2} = \$1.40$$

Step 3: **Calculate the percentage change in the quantity demanded and the percentage change in price for demand curve D_1.**

$$\text{Percentage change in quantity demanded} = \frac{2{,}500 - 2{,}000}{2{,}250} \times 100 = 22.2\%$$

$$\text{Percentage change in price} = \frac{\$1.30 - \$1.50}{\$1.40} \times 100 = -14.3\%$$

Step 4: Divide the percentage change in the quantity demanded by the percentage change in price to arrive at the price elasticity for demand curve D_1.

$$\text{Price elasticity of demand} = \frac{22.2\%}{-14.3\%} = -1.6$$

Because the elasticity is greater than 1 in absolute value, D_1 is price *elastic* between these two prices.

Step 5: Calculate the price elasticity of demand curve D_2 between these two prices.

$$\text{Percentage change in quantity demanded} = \frac{2{,}100 - 2{,}000}{2{,}050} \times 100 = 4.9\%$$

$$\text{Percentage change in price} = \frac{\$1.30 - \$1.50}{\$1.40} \times 100 = -14.3\%$$

$$\text{Price elasticity of demand} = \frac{4.9\%}{-14.3\%} = -0.3$$

Because the elasticity is less than 1 in absolute value, D_2 is price *inelastic* between these two prices.

Your Turn: For more practice, do related problem 1.11 at the end of this chapter.

When Demand Curves Intersect, the Flatter Curve Is More Elastic

Remember that *elasticity* is not the same thing as *slope*. While slope is calculated using changes in quantity and price, elasticity is calculated using percentage changes. But it *is* true that if two demand curves intersect:

- The demand curve with the smaller slope (in absolute value)—the flatter demand curve—is more elastic.
- The demand curve with the larger slope (in absolute value)—the steeper demand curve—is less elastic.

In Figure 6.1, for a given change in price, demand curve D_1 is more elastic than demand curve D_2.

Polar Cases of Perfectly Inelastic and Perfectly Elastic Demand

Perfectly inelastic demand The case where the quantity demanded is completely unresponsive to price and the price elasticity of demand equals zero.

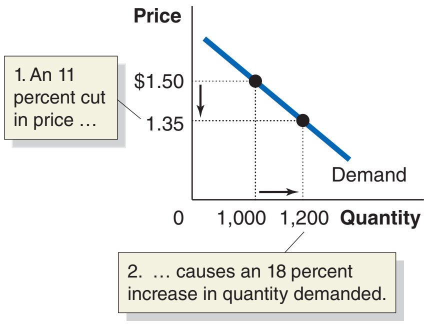
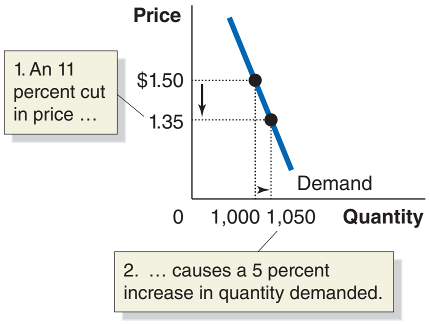
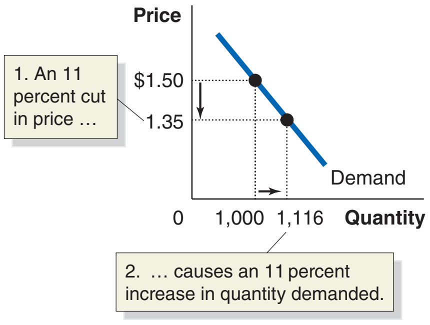
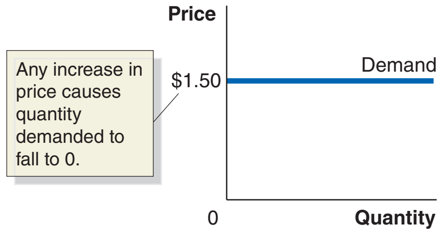
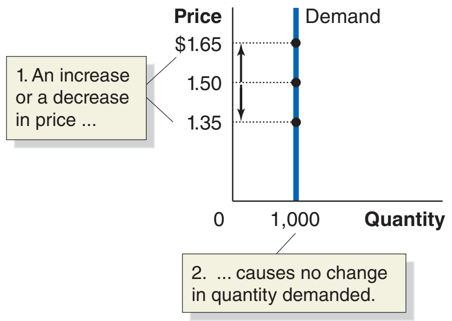
Perfectly elastic demand The case where the quantity demanded is infinitely responsive to price and the price elasticity of demand equals infinity.

Although extreme, or *polar*, cases of price elasticity do not occur frequently, you should be aware of them. If a demand curve is a vertical line, it is **perfectly inelastic**. In this case, the quantity demanded is completely unresponsive to price, and the price elasticity of demand equals zero. No matter how much price may increase or decrease, the quantity remains the same. For only a very few products will the quantity demanded be completely unresponsive to the price, making the demand curve a vertical line. The drug insulin is an example. Some diabetics must take a certain amount of insulin each day. If the price of insulin declines, it will not affect the required dose and therefore will not increase the quantity demanded. Similarly, a price increase will not affect the required dose or decrease the quantity demanded. (Of course, some diabetics may not be able to afford insulin at a higher price. If so, even for this good, the demand curve may not be completely vertical and, therefore, not perfectly inelastic.)

If a demand curve is a horizontal line, it is **perfectly elastic**. In this case, the quantity demanded is infinitely responsive to price, and the price elasticity of demand equals infinity. If a demand curve is perfectly elastic, an increase in price causes the quantity demanded to fall to zero. Once again, perfectly elastic demand curves are rare, and it is important not to confuse *elastic* with *perfectly elastic*. Table 6.1 summarizes the different price elasticities of demand using the example of 2-liter bottles of soda. (Note that the table uses the midpoint formula to calculate the elasticities.)

Table 6.1

Summary of the Price Elasticity of Demand

If demand is ...	then the absolute value of price elasticity is ...	
elastic	greater than 1	 1. An 11 percent cut in price ... 2. ... causes an 18 percent increase in quantity demanded.
inelastic	less than 1	 1. An 11 percent cut in price ... 2. ... causes a 5 percent increase in quantity demanded.
unit elastic	equal to 1	 1. An 11 percent cut in price ... 2. ... causes an 11 percent increase in quantity demanded.
perfectly elastic	equal to infinity	 Any increase in price causes quantity demanded to fall to 0.
perfectly inelastic	equal to 0	 1. An increase or a decrease in price ... 2. ... causes no change in quantity demanded.

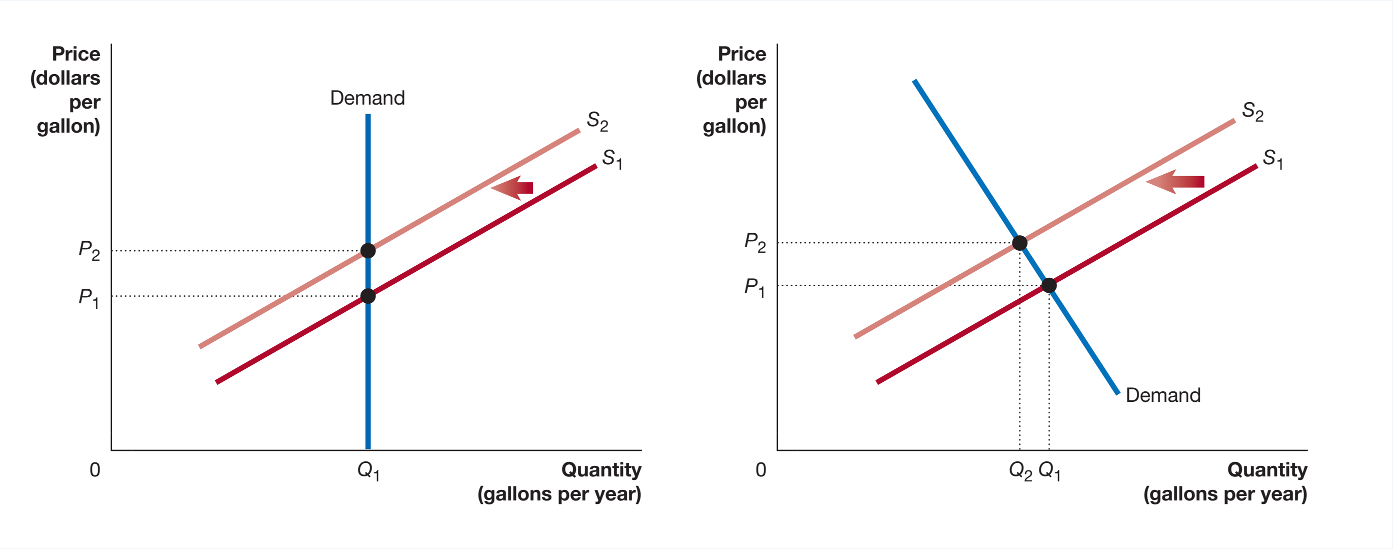
Don’t Let This Happen to You

Don’t Confuse Inelastic with Perfectly Inelastic

You may be tempted to simplify the concept of elasticity by assuming that any demand curve described as being inelastic is *perfectly* inelastic. You should never make this assumption because perfectly inelastic demand curves are rare. For example, consider the following problem: “Use a demand and supply graph to show how a decrease in supply affects the equilibrium quantity of gasoline. Assume that the demand for gasoline is inelastic.” The graph on the left would be an *incorrect* answer to this problem.

Most economists believe that the demand for gasoline is inelastic, but it is not *perfectly* inelastic. When the price of gasoline rises, the quantity demanded falls. So, the correct answer to this problem would use a graph like the one on the right, showing a typical downward-sloping demand curve rather than a vertical demand curve.

Your Turn: Test your understanding by doing related problem 1.12 at the end of this chapter.



The Many Uses of Elasticity: An Example from Law Enforcement Policy in Denmark

We’ve just studied the price elasticity of demand, which measures the effect of changes in price on changes in the quantity demanded of a good. In fact, though, elasticity is a general concept that economists use in many contexts when they want to measure the effect of a change in one variable on another variable. An example of a more general use of elasticity appears in an academic paper written by Anne Sofie Tegner Anker of the University of Copenhagen, Jennifer Doleac of Texas A&M University, and Rasmus Landersø of Aarshus University.

The authors studied efficient ways of deterring crime. They note that rational offenders will be deterred by government policies that increase the probability that an offender will be arrested. Even offenders who don’t respond rationally to an increase in the probability of being arrested will still commit fewer crimes because they are more likely to be arrested. Governments can use different policies to reduce crime. Given that government resources are scarce, efficient allocation of resources requires policymakers to choose policies that provide the most deterrence per dollar of cost (or in the case of Denmark, krone of cost).

The authors note “we currently know very little about precisely how much deterrence we achieve for any given increase in the likelihood that an offender is apprehended.” To research this point, the authors analyzed the effects of a policy change in

Denmark in 2005 that made it much more likely that an offender would have his or her DNA entered into a DNA database. The authors note, "The goal of DNA registration is to deter offenders and increase the likelihood of detection of future crimes by enabling matches of known offenders with DNA from crime scene evidence."

The authors find that the expansion of Denmark's DNA database had a substantial effect on offenders committing additional crimes and on the probability that an offender who did commit additional crimes would be caught. They estimate that "a 1 percent higher detection probability reduces crime by more than 2 percent." In other words, the elasticity of crime with respect to the detection probability is -2.

Just as the price elasticity of demand gives a business manager a useful way to summarize the responsiveness of the quantity demanded of the firm's product to a change in its price, the elasticity the authors estimated gives a policymaker a useful way to summarize the responsiveness of crime to a policy that increases the probability of catching offenders.

6.2 The Determinants of the Price Elasticity of Demand

LEARNING OBJECTIVE: List and explain the determinants of the price elasticity of demand.

We have seen that the demand for some products may be elastic, while the demand for other products may be inelastic. In this section, we examine why price elasticities differ among products. The key determinants of the price elasticity of demand are:

- The availability of close substitutes for the good
- The passage of time
- Whether the good is a luxury or a necessity
- The definition of the market
- The share of the good in the consumer's budget

Availability of Close Substitutes

How consumers react to a change in the price of a product depends on whether there are alternative products. So the availability of substitutes is the most important determinant of the price elasticity of demand. For example, when the price of gasoline rises, consumers have few alternatives, so the quantity demanded falls only a little. But if the price of pizza rises, consumers have many alternative foods they can eat, so the quantity demanded is likely to fall substantially. In fact, a key constraint on a firm's pricing policies is how many close substitutes exist for its product. In general, *if a product has more substitutes available, it will have a more elastic demand. If a product has fewer substitutes available, it will have a less elastic demand.*

Passage of Time

It usually takes consumers some time to adjust their buying habits when prices change. If the price of chicken falls, for example, it takes a while before consumers decide to change from eating chicken for dinner once a week to eating it twice a week. If the price of gasoline increases, it also takes a while for consumers to decide to take public transportation, to buy more fuel-efficient cars, or to find new jobs closer to where they live. *The more time that passes, the more elastic the demand for a product becomes.*

Luxuries versus Necessities

Goods that are luxuries usually have more elastic demand curves than goods that are necessities. For example, the demand for milk is inelastic because milk is a necessity, and the quantity that people buy is not very dependent on its price. Tickets to a concert are a luxury, so the demand for concert tickets is much more elastic than the demand for milk. *The demand curve for a luxury is more elastic than the demand curve for a necessity.*

Definition of the Market

In a narrowly defined market, consumers have more substitutes available. For example, if you own a service station and raise the price you charge for gasoline, many of your customers will switch to buying from a competitor. So, the demand for gasoline at one particular station is likely to be elastic. The demand for gasoline as a product, in contrast, is inelastic because consumers have few alternatives (in the short run) to buying it. *The more narrowly we define a market, the more elastic demand will be.*

Share of a Good in a Consumer's Budget

Goods that take only a small fraction of a consumer's budget tend to have less elastic demand than goods that take a large fraction. For example, most people buy table salt infrequently and in relatively small quantities. The share of an average consumer's budget that is spent on salt is very low. So, even a doubling of the price of salt is likely to result in only a small decline in the quantity of salt demanded. "Big-ticket items," such as houses, cars, and furniture, take up a larger share of the average consumer's budget. Increases in the prices of these goods are likely to result in significant declines in the quantity demanded. In general, *the demand for a good will be more elastic the larger the share of the good in the average consumer's budget.*

Some Estimated Price Elasticities of Demand

Figure 6.2 shows some estimated short-run price elasticities of demand. It's important to remember that estimates of the price elasticities of different goods can vary, depending on the data used and the time period over which the estimates were made. The results

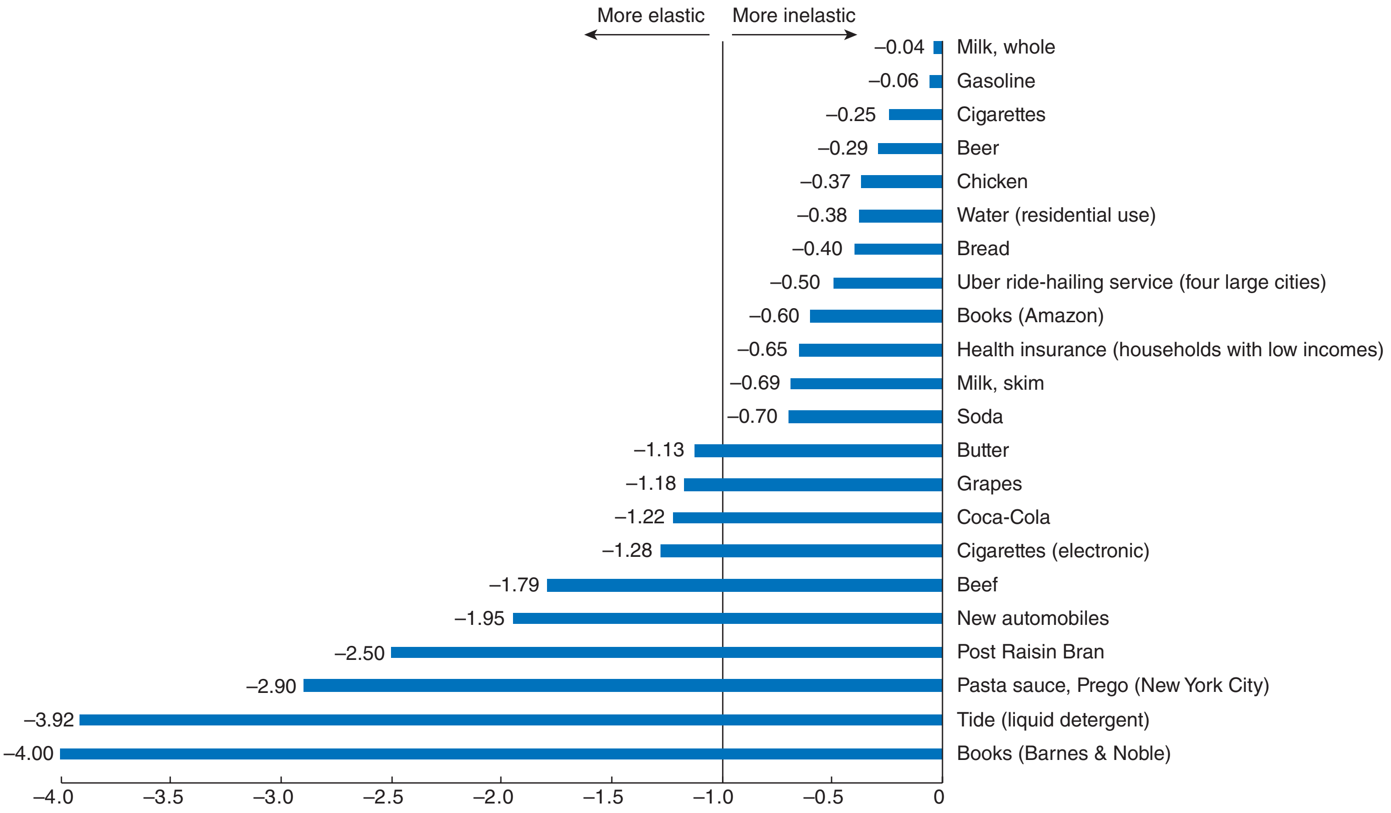


Figure 6.2 **Estimated Real-World Price Elasticities of Demand**

The larger (in absolute value) the price elasticity of demand, the more responsive a good is to changes in price. The smaller the price elasticity of demand, the less responsive a good is to changes in price. Goods for which there are few substitutes are price inelastic, as are broadly defined goods. Goods for which there are easily available substitutes, such as particular brand name products, are price elastic.

Source: See Text Credits at the back of the book for complete source list.

given in the table are consistent with our discussion of the determinants of price elasticity. Goods for which there are few substitutes, such as cigarettes, gasoline, and health insurance, are price inelastic, as are broadly defined goods, such as bread and soda. There are easily available substitutes for particular brand name products, such as Coca-Cola, Post Raisin Bran, Tide laundry detergent, or Prego spaghetti sauce, so demand for these products is price elastic.

Figure 6.2 also shows that:

- The demand for books bought from a particular retailer is typically price elastic. Note, though, that the demand for books from Amazon is inelastic, which indicates that consumers do not consider other online sites to be good substitutes for Amazon.
- An increase in the price of grapes will lead some consumers to substitute other fruits, so demand for grapes is price elastic.
- Similarly, an increase in the price of new automobiles will lead some consumers to buy used automobiles or to continue driving their current cars, so demand for automobiles is also price elastic.
- The demand for necessities, such as milk and water, is price inelastic. Judging from the price elasticity of demand, in the four large cities (New York, San Francisco, Los Angeles, and Chicago) from which the Uber data were collected, consumers consider the ride-hailing service to be a necessity.

6.3 The Relationship between Price Elasticity of Demand and Total Revenue

LEARNING OBJECTIVE: Explain the relationship between the price elasticity of demand and total revenue.

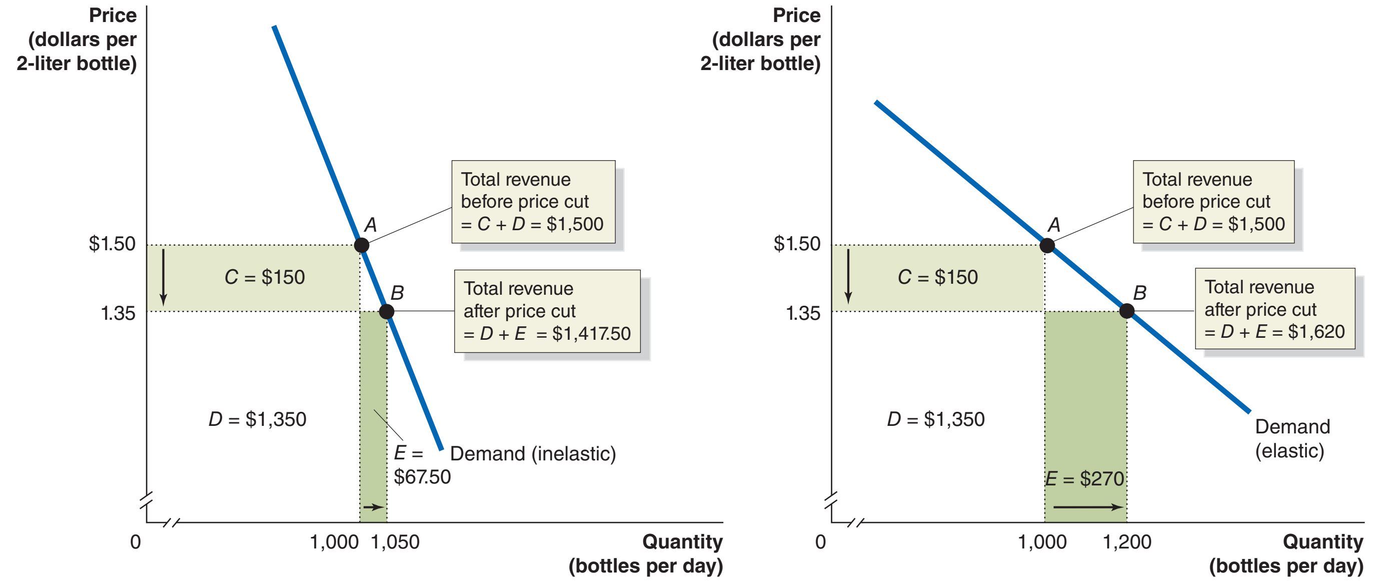
Knowing the price elasticity of demand allows a firm to calculate how changes in price will affect its **total revenue**, which is the total amount of funds it receives from selling a good or service. Total revenue is calculated by multiplying price per unit by the number of units sold. Whether total revenue increases or decreases following a price change depends on the price elasticity of demand:

Total revenue The total amount of funds a seller receives from selling a good or service, calculated by multiplying price per unit by the number of units sold.

- When demand is inelastic, price and total revenue move in the same direction: An increase in price raises total revenue, and a decrease in price reduces total revenue.
- When demand is elastic, price and total revenue move inversely: An increase in price reduces total revenue, and a decrease in price raises total revenue.

To understand the relationship between price elasticity and total revenue, consider Figure 6.3. Panel (a) shows a demand curve for soda that is inelastic between point *A* and point *B*. (It was demand curve D_2 in Figure 6.1.) The total revenue you receive from selling soda in your grocery store at point *A* equals the price, $1.50, multiplied by the 1,000 bottles sold, or $1,500. This amount equals the areas of rectangles *C* and *D* in the figure because together the rectangles have a height of $1.50 and a base of 1,000 bottles. Because this demand curve is inelastic between point *A* and point *B*, cutting the price to $1.35 (point *B*) reduces total revenue. The new total revenue is shown by the areas of rectangles *D* and *E* and is equal to $1.35 multiplied by 1,050 bottles, or $1,417.50. Total revenue falls because the increase in the quantity demanded is not large enough to make up for the decrease in price. As a result, the $67.50 increase in revenue gained as a result of the price cut—rectangle *E*—is less than the $150 in revenue lost—rectangle *C*.

Panel (b) of Figure 6.3 shows a demand curve that is elastic between point *A* and point *B*. (It was demand curve D_1 in Figure 6.1.) With this demand curve, cutting the price increases total revenue. At point *A*, the areas of rectangles *C* and *D* are still equal to $1,500, but at point *B*, the areas of rectangles *D* and *E* are equal to $1.35 multiplied by 1,200 bottles, or $1,620. Here, total revenue rises because the increase in the quantity demanded is large enough to offset the lower price. As a result, the $270 increase in revenue gained as a result of the price cut—rectangle *E*—is greater than the $150 in revenue lost—rectangle *C*.



(a) Cutting price when demand is inelastic reduces total revenue.

(b) Cutting price when demand is elastic increases total revenue.

Figure 6.3 **The Relationship between Price Elasticity and Total Revenue**

When demand is inelastic, a cut in price will decrease total revenue. In panel (a), at point *A*, the price is $1.50, 1,000 bottles are sold, and the total revenue you receive equals $1.50 × 1,000 bottles, or $1,500. At point *B*, cutting the price to $1.35 increases the quantity demanded to 1,050 bottles, but the fall in price more than offsets the increase in quantity. As a result, revenue falls to $1.35 × 1,050 gallons, or $1,417.50. When demand is elastic, a cut in the price will increase total revenue. In panel (b), at point *A*, the areas of rectangles *C* and *D* are still equal to $1,500. But, at point *B*, the areas of rectangles *D* and *E* are equal to $1.35 × 1,200 bottles, or $1,620. In this case, the increase in the quantity demanded is large enough to offset the fall in price, so total revenue increases.

A less common possibility than those shown in Figure 6.3 is that demand is unit elastic. In that case, a small change in price is exactly offset by a proportional change in the quantity demanded, leaving revenue unaffected. Therefore, when demand is unit elastic, neither a decrease nor an increase in price affects revenue. Table 6.2 summarizes the relationship between price elasticity and revenue.

Table 6.2

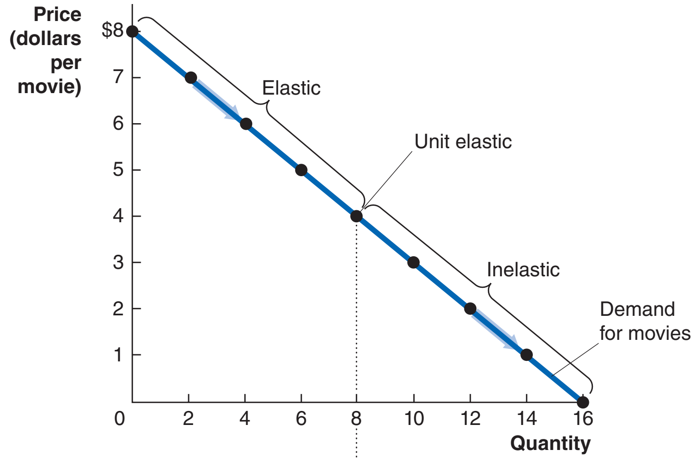
The Relationship between Price Elasticity and Revenue

If demand is . . .	then . . .	because . . .
elastic	an increase in price reduces revenue	the decrease in quantity demanded is proportionally *greater* than the increase in price.
elastic	a decrease in price increases revenue	the increase in quantity demanded is proportionally *greater* than the decrease in price.
inelastic	an increase in price increases revenue	the decrease in quantity demanded is proportionally *smaller* than the increase in price.
inelastic	a decrease in price reduces revenue	the increase in quantity demanded is proportionally *smaller* than the decrease in price.
unit elastic	an increase in price does not affect revenue	the decrease in quantity demanded is proportionally *the same as* the increase in price.
unit elastic	a decrease in price does not affect revenue	the increase in quantity demanded is proportionally *the same as* the decrease in price.

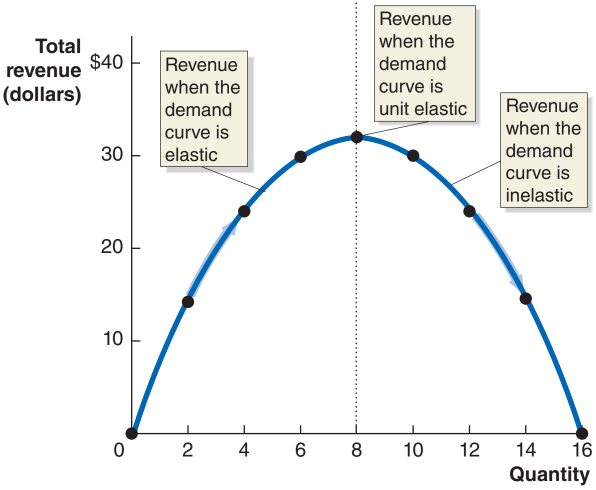
Elasticity and Revenue with a Linear Demand Curve

Along most demand curves, elasticity is not constant at every point. For example, a straight-line, or linear, demand curve for renting movies on iTunes or another site is shown in panel (a) of Figure 6.4. (For simplicity, small quantities are used.) The numbers from the table are plotted in the graphs. The demand curve shows that when the price drops by $1 per movie, consumers always respond by renting 2 more movies per month. When the price is high and the quantity demanded is low, demand is elastic. Demand is elastic because a $1 drop in price is a smaller percentage change when the price is high, and an increase of 2 movies is a larger percentage change when the quantity of movies rented is low. By similar reasoning, we can see why demand is inelastic when the price is low and the quantity demanded is high.

Panel (a) in Figure 6.4 shows that when price is between $8 and $4 and quantity demanded is between 0 movies and 8 movies, demand is elastic. Panel (b) shows that over this same range, total revenue will increase as price falls. For example, in panel (a), as price falls from $7 to $6, the quantity demanded increases from 2 to 4, and in panel (b), total revenue increases from $14 to $24. Similarly, when price is between



(a) Demand curve for movies



(b) Total revenue curve

Price	Quantity Demanded	Total Revenue
$8	0	$0
7	2	14
6	4	24
5	6	30
4	8	32
3	10	30
2	12	24
1	14	14
0	16	0

Figure 6.4 **Elasticity Is Not Constant along a Linear Demand Curve**

The data from the table are plotted in the graphs. Panel (a) shows that as we move down the demand curve for renting movies, the price elasticity of demand declines. In other words, at higher prices, demand is elastic, and at lower prices, demand is inelastic. Panel (b) shows that as the quantity of movies rented increases from 0, revenue will increase until it reaches a maximum of $32 when 8 movies are rented. As purchases increase beyond 8 movies, revenue falls because demand is inelastic on this portion of the demand curve.

$4 and $0 and the quantity demanded is between 8 and 16, demand is inelastic. Over this same range, total revenue will decrease as price falls. For example, as price falls from $3 to $2 and the quantity demanded increases from 10 to 12, total revenue decreases from $30 to $24.

Solved Problem 6.3

Price and Revenue Don't Always Move in the Same Direction

The city of Bethlehem, Pennsylvania, was considering raising the fine from $10 to $15 for cars parked at a meter whose time had expired. The city's parking authority believed that raising the fine would increase parking revenue from $5.5 million to $5.9 million. The director of the city's parking authority was quoted as saying that the purpose of increasing the fine was to "discourage illegal parking" and "to allow the parking authority to construct a new parking garage."

a. Did the parking authority believe that the demand for parking at an expired meter was elastic or inelastic? Briefly explain.

b. Would the parking authority be more successful in meeting its goal of discouraging illegal parking if the demand for parking at an expired meter were more elastic or more inelastic? Would it be more successful in meeting its goal for raising more revenue for building a new parking garage if the demand for parking at an expired meter were more elastic or more inelastic? Briefly explain in what sense the parking authority's goals were in conflict.

Solving the Problem

Step 1: **Review the chapter material.** This problem deals with the effect of a price change on a firm's revenue, so you may want to review the section "The Relationship between Price Elasticity of Demand and Total Revenue."

Step 2: **Answer part (a) by explaining how the parking authority viewed the elasticity of demand for parking at an expired meter.** In effect, a parking fine represents the price of parking at an expired meter. The parking authority must believe that the demand for parking at an expired meter is price inelastic if it believes that increasing the fine (price) will increase the revenue raised from parking fines.

Step 3: **Answer part (b) by using the concept of price elasticity to discuss whether the parking authority's goals were in conflict.** The more price elastic demand for parking is, the more successful the parking authority will be in reaching its goal of discouraging illegal parking. This conclusion follows because the greater the price elasticity of demand, the greater the decline in the quantity demanded as a result of a given percentage increase in price. But to raise more revenue for building a new parking garage, the parking authority is better off the more price inelastic the demand for parking at expired meters is. The more price inelastic demand is, the smaller the decline in the quantity demanded and the greater the increase in revenue that results from a given percentage increase in price. We can conclude that the parking authority's goals were in conflict because (1) the more the increased fine discouraged illegal parking, the less revenue raised for the new garage, and (2) the less the increased fine discouraged illegal parking, the more revenue the parking authority would raise for the new garage.

Extra Credit: Note that the situation facing the parking authority in Bethlehem, Pennsylvania, was similar to the situation facing the city of Philadelphia described in the chapter opener. The city was hoping that a soda tax would at the same time discourage people from drinking sugar-sweetened drinks and raise additional revenue for the city. The mayor had expected that the tax would raise revenue to help fund a prekindergarten program, among other projects. But the more effective the tax was in reducing soda consumption, the less revenue the tax would raise.

Your Turn: For more practice, do related problem 3.10 at the end of this chapter.

Apply the Concept

Tesla Tests the Price Elasticity of Demand for Its Electric Vehicles

Grzegorz Czapski/Alamy Stock Photo

In early 2023, Tesla announced substantial price cuts for its models as the demand for Teslas became more price elastic.

In early 2023, Tesla's managers concluded that demand for its vehicles had become more price elastic. As a result, they announced substantial price cuts, including a 14 percent cut in the price of the Model 3.

To know the price elasticity of demand for the product it sells, a firm needs information on the demand curve for that product. For relatively new products, a firm may be unsure of its demand curve because it lacks experience with how consumers respond to changes in the price of the firm's product. Elon Musk, CEO of Tesla Motors, has faced this problem in the market for electric vehicles. Musk's goal has been to make electric cars both cool and affordable to the average car buyer. When Tesla was founded in 2003, it faced competition from existing cars with hybrid engines (part electric and part gasoline), such as the Toyota Prius, and from all-electric cars, like the General Motors EV1. But U.S. and foreign carmakers were primarily selling cars with conventional gasoline engines.

Tesla's cars, first offered for sale in 2008, were immediately popular. But the only model the firm offered at that time had a starting price of $109,000. The Model S sedan, introduced in 2012, and the Model X sports utility vehicle, introduced in 2015, have starting prices over $70,000. Musk's plan to sell a model with a price low enough to compete with mass-produced cars with gasoline engines, such as the Toyota Corolla and Honda Civic, depended on the success of his Model 3, which became available in 2017.

Although Musk had hoped to sell the Model 3 for $35,000, the least-expensive version available had a price of $39,500. Most buyers wanted options—such as a bigger battery that would allow them to drive farther—that pushed the price above $45,000. At a price of $35,000, Tesla would have lost several thousand dollars on each Model 3 sold. The demand for Model 3s turned out to be more price inelastic than Musk had expected. Despite the price being well above his $35,000 target, through most of 2022, Tesla was able to sell all of the Model 3s it produced.

But in the last three months of 2022, Tesla failed to meet its sales targets for the Model 3 and its other models. In early 2023, Tesla announced substantial price cuts for its models, including a 14 percent cut in the price of the Model 3. Although the Model 3 was still the best-selling electric vehicle in the United States, other car firms had sharply increased the number of electric cars they had introduced to the market. Sales of Ford's electric version of its Mustang sports car and F-150 pickup truck were strong, as were sales of Hyundai's Kona, Kia's EV6, and General Motors's Chevrolet Bolt. This increased competition was reflected in a *Wall Street Journal* article headlined "What If Tesla Is . . . Just a Car Company?" The article noted that "Tesla's U.S. rivals are borrowing heavily from Tesla's playbook as they ramp up EV production—capturing buyers' attention with new models."

As we saw in Section 6.2, the more substitutes consumers have available for a good, the more price elastic the demand for the good will be. As consumers had more electric vehicles to choose from, the demand for Teslas became more price elastic. When demand is price elastic, a reduction in price increases the revenue a firm earns from sales of a good. Therefore, it was unsurprising that an increase in the number of competing electric vehicles led Tesla to cut the price of the Model 3. An article in the *Wall Street Journal* quoted Musk as saying: "even small changes in the price have a big effect on demand, very big." (Tesla had the additional incentive to cut the prices of its higher-priced versions of the Model 3 because under a new federal law, some buyers of electric vehicles would under certain conditions be eligible for a $7,500 federal income tax credit only if the price of the vehicle was less than $55,000.)

The problem that Tesla faced in determining the price elasticity of demand for its electric vehicles is a common one for firms introducing new products to the market.

Your Turn: Test your understanding by doing related problem 3.12 at the end of this chapter.

6.4

Other Demand Elasticities

LEARNING OBJECTIVE: Define and calculate the cross-price elasticity of demand and the income elasticity of demand and explain their determinants.

Elasticity is an important concept in economics because it allows us to quantify the responsiveness of one economic variable to changes in another economic variable. In addition to price elasticity, two other demand elasticities are important:

1. Cross-price elasticity of demand
2. Income elasticity of demand

Cross-Price Elasticity of Demand

Cross-price elasticity of demand The percentage change in the quantity demanded of one good divided by the percentage change in the price of another good.

Suppose you work at Apple, and you need to predict the effect of an increase in the price of Samsung's Galaxy smartphone on the quantity of Apple iPhones demanded, holding other factors constant. You can do this by calculating the **cross-price elasticity of demand**, which is the percentage change in the quantity of Apple iPhones demanded divided by the percentage change in the price of Galaxy smartphones—or, in general:

$$\text{Cross-price elasticity of demand} = \frac{\text{Percentage change in quantity demanded of one good}}{\text{Percentage change in price of another good}}.$$

The cross-price elasticity of demand is positive or negative, depending on whether the two products are substitutes or complements. Recall that substitutes are products that can be used for the same purpose, such as two brands of smartphones. Complements are products that are used together, such as iPhones and earbuds or earphones. Here are two key points to note:

1. An increase in the price of a substitute will lead to an increase in the quantity demanded, so the cross-price elasticity of demand will be positive.
2. An increase in the price of a complement will lead to a decrease in the quantity demanded, so the cross-price elasticity of demand will be negative.

Of course, if the two products are unrelated—such as iPhones and peanut butter—the cross-price elasticity of demand will be zero. Table 6.3 summarizes the key points about the cross-price elasticity of demand.

Cross-price elasticity of demand is important to firm managers because it allows them to measure whether products sold by other firms are close substitutes for their products. For example, PepsiCo and Coca-Cola both spend heavily on advertising, each hoping to convince consumers that its cola tastes better than its rival's. How can these firms tell whether their advertising campaigns have been effective? One way is by seeing whether the cross-price elasticity of demand has changed. If, for instance, Coca-Cola has a successful advertising campaign that convinces consumers that Pepsi isn't a close substitute for Coke, then when it increases the price of Coke, the percentage increase in sales of Pepsi should be smaller. In other words, the value of the cross-price elasticity of demand should have declined.

Table 6.3

Summary of Cross-Price Elasticity of Demand

If the products are . . .	then the cross-price elasticity of demand will be . . .	Example
substitutes	positive.	Two brands of smartphones
complements	negative.	iPhones and applications downloaded from online stores
unrelated	zero.	iPhones and peanut butter

Table 6.4

Summary of Income Elasticity of Demand

If the income elasticity of demand is . . .	then the good is . . .	Example
positive but less than 1	normal and a necessity.	Bread
positive and greater than 1	normal and a luxury.	Caviar
negative	inferior.	High-fat meat

Income Elasticity of Demand

The **income elasticity of demand** measures the responsiveness of the quantity demanded to changes in income. It is calculated as follows:

Income elasticity of demand A measure of the responsiveness of the quantity demanded to changes in income, measured by the percentage change in the quantity demanded divided by the percentage change in income.

$$\text{Income elasticity of demand} = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in income}}.$$

We know that if the quantity demanded of a good increases as income increases, the good is a *normal good* (see Chapter 3, Section 3.1). Normal goods are often further subdivided into *luxuries* and *necessities.* A good is a luxury if the quantity demanded is very responsive to changes in income so that a 10 percent increase in income results in more than a 10 percent increase in the quantity demanded. Expensive jewelry and vacation homes are examples of luxuries. A good is a necessity if the quantity demanded is not very responsive to changes in income so that a 10 percent increase in income results in less than a 10 percent increase in the quantity demanded. Food and clothing are examples of necessities. A good is *inferior* if the quantity demanded falls when income increases. Ground beef with a high fat content is an example of an inferior good. We should note that *normal good*, *inferior good*, *necessity*, and *luxury* are labels economists use for goods with different income elasticities; the labels are not intended to be value judgments about the worth of these goods.

Because most goods are normal goods, during periods of economic expansion when consumer income is rising, most firms can expect—holding other factors constant—that the quantity demanded of their products will increase. Sellers of luxuries can expect particularly large increases. During recessions, falling consumer income can cause firms to experience increases in demand for inferior goods. For example, the demand for long-distance bus trips increases as consumers cut back on air travel, and supermarkets find that the demand for canned tuna increases relative to the demand for fresh salmon. Table 6.4 summarizes the key points about the income elasticity of demand.

Apply the Concept

Price Elasticity, Cross-Price Elasticity, and Income Elasticity in the Market for Alcoholic Beverages

Many public policy issues are related to the consumption of alcoholic beverages. These issues include underage drinking, drunk driving, and the possible beneficial effects of red wine in lowering the risk of heart disease. Knowing how responsive the demand for alcohol is to changes in price provides insight into these policy issues. Christopher Ruhm of the University of Virginia and colleagues estimated statistically the following elasticities. (*Spirits* refers to all beverages that contain alcohol, other than beer and wine.)

Price elasticity of demand for beer	−0.30
Cross-price elasticity of demand between beer and wine	−0.83
Cross-price elasticity of demand between beer and spirits	−0.50
Income elasticity of demand for beer	0.09

These results indicate that the demand for beer is inelastic. A 10 percent increase in the price of beer will result in a 3 percent decline in the quantity of beer demanded. Somewhat surprisingly, both wine and spirits are complements for beer rather than substitutes. A 10 percent increase in the price of wine will result in an 8.3 percent *decrease* in the quantity of beer demanded. Previous studies of the price elasticity of beer found that beer was a substitute for other alcoholic drinks. Ruhm and his colleagues argued that their results are more reliable because they used universal product code (UPC) scanner data on prices and quantities sold in grocery stores. They noted that these price data are more accurate than the data used in many previous studies that included the prices of only one brand each of beer, wine, and whiskey.

The results in the table also show that a 10 percent increase in income will result in a 0.9 percent *increase* in the quantity of beer demanded. So, beer is a normal good. According to the definitions given earlier, beer would be classified as a necessity because it has an income elasticity that is positive but less than 1.

Your Turn: Test your understanding by doing related problem 4.9 at the end of this chapter.

6.5 Using Elasticity to Analyze the Disappearing Family Farm

LEARNING OBJECTIVE: Use price elasticity and income elasticity to analyze economic issues.

The concepts of price elasticity and income elasticity can help us understand many economic issues. For example, some people are concerned that the family farm is becoming an endangered species in the United States. Although food production has been growing steadily, the numbers of farms and farmers continue to dwindle. In 1950, the United States had more than 5.6 million farms, and more than 23 million people lived on farms. By 2022, only 2 million farms remained, and fewer than 3 million people lived on them. The federal government has several programs that are intended to aid farmers (see Chapter 4, Section 4.3), particularly those who own small family-operated farms. But growth in farm production, combined with low price and income elasticities for most food products, have made it difficult for owners of family farms to earn a profit.

Productivity measures the ability of firms to produce goods and services with given quantities of economic inputs, such as workers, machines, and land. Productivity has grown very rapidly in U.S. agriculture. In 1950, the average U.S. wheat farmer harvested about 17 bushels from each acre of wheat planted. By 2022, because of the development of superior strains of wheat and improvements in farming techniques, the average American wheat farmer harvested 47 bushels per acre. So, even though the total number of acres devoted to growing wheat declined from about 62 million to about 37 million, total wheat production rose from about 1.0 billion bushels to about 1.6 billion.

Unfortunately for U.S. farmers, this increase in wheat production resulted in a substantial decline in wheat prices. Two key factors explain this decline: (1) The demand for wheat is price inelastic, and (2) the income elasticity of demand for wheat is low. Even though the U.S. population has increased greatly since 1950 and the income of the average American is much higher than it was in 1950, the demand for wheat has increased only moderately. For all of the additional wheat to be sold, the price has had to decline. Because the demand for wheat is inelastic, the price decline has been substantial. Figure 6.5 illustrates these points.

A large shift in supply, a small shift in demand, and an inelastic demand curve combined to drive down the price of wheat from $22.86 per bushel in 1950 to $9.10 in 2022. (We have adjusted the 1950 wheat price to account for the general increase in prices—inflation—since 1950.) With low prices, only the most efficiently run farms have been able to remain profitable. Small family-run farms have found it difficult to survive, and many of these farms have disappeared. The markets for most other food

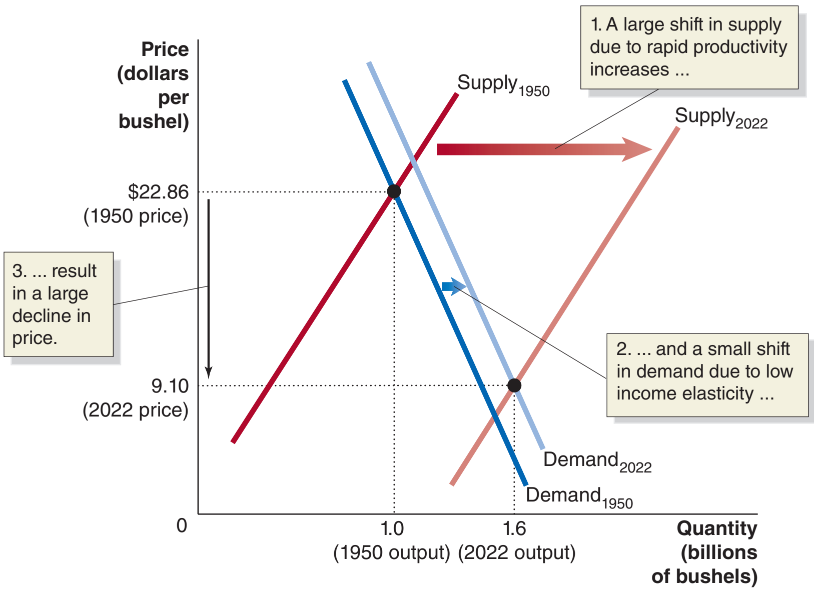


Figure 6.5

Elasticity and the Disappearing Family Farm

In 1950, U.S. farmers produced 1.0 billion bushels of wheat at a price of $22.86 per bushel. Over the next 72 years, rapid increases in farm productivity caused a large shift to the right in the supply curve for wheat. The income elasticity of demand for wheat is low, so the demand for wheat increased relatively little over this period. Because the demand for wheat is also inelastic, the large shift in the supply curve and the small shift in the demand curve resulted in a sharp decline in the price of wheat, from $22.86 per bushel in 1950 to $9.10 in 2022.

Source: U.S. Department of Agriculture, *Wheat Yearbook Tables*, January 13, 2023.

products are similar to the market for wheat. They are characterized by output growth and low income and price elasticities. The result is the paradox of U.S. farming: ever more abundant and cheaper food, supplied by fewer and fewer farms. U.S. consumers have benefited, but most family farmers have not.

Solved Problem 6.5

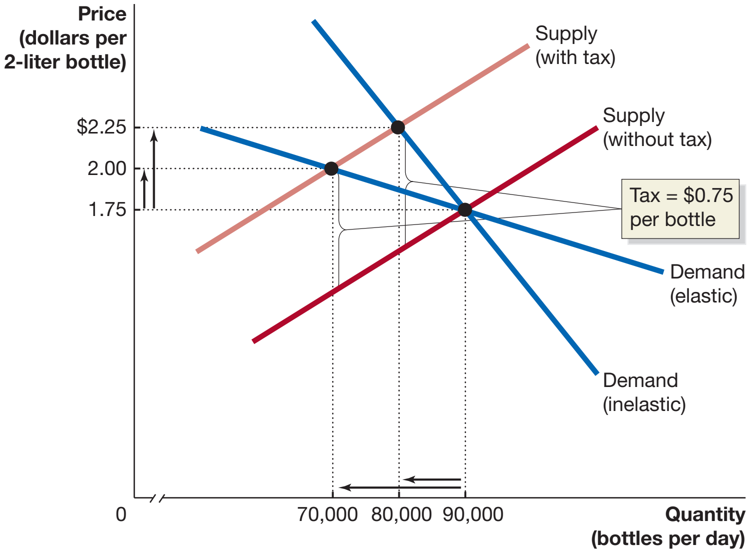
Using Price Elasticity to Analyze the Effects of a Soda Tax

Some economists, health professionals, and policymakers argue in favor of a soda tax because they believe that people who drink sweetened beverages can experience health problems. Some city governments also believe that implementing a soda tax is a good way to raise tax revenues. If the main goal of a soda tax is to reduce consumption of sweetened beverages, will the tax be more effective if the demand for sweetened beverages is price elastic or if it is price inelastic? What about if the main goal is to raise tax revenue for a city government? Assume that the tax is $0.75 per bottle of soda and that prior to the tax being imposed, the equilibrium quantity of soda sold in the city was 90,000 bottles per day and the equilibrium price was $1.75 per bottle. Illustrate your answer with a graph of the market for soda in the city and summarize the key results in a table.

Solving the Problem

Step 1: **Review the chapter material.** This problem deals with the effect of a price change on quantity demanded and revenue, so you may want to review the previous section "The Relationship between Price Elasticity of Demand and Total Revenue." (Note: To review the effects on a market of a government imposing a tax, see Chapter 4, Section 4.4.)

Step 2: **Answer the question by explaining the effect of the price elasticity of demand for soda on the effectiveness of a soda tax in attaining policymakers' goals and by drawing a graph to illustrate your answer.** We know from Chapter 4, Section 4.4, that the effect of the soda tax will be to shift up the supply curve for soda by the amount of the tax from Supply (without tax) to Supply (with tax). Your graph should show that when demand is price inelastic, a tax causes (1) the equilibrium quantity of bottles sold per day to fall by less, and (2) the equilibrium price to rise by more than when demand is price elastic. As shown in the following graph, which uses hypothetical values, the equilibrium quantity demanded falls from 90,000 to 80,000 when demand is price inelastic and from 90,000 to 70,000 when demand is price elastic. The equilibrium price rises from $1.75 per bottle to $2.25 when demand is price inelastic and from $1.75 to $2.00 when demand is elastic. Given these values, when the demand for soda is price inelastic, the city government collects tax revenue of $0.75 per bottle multiplied by 80,000 bottles, or $60,000 per day. When the demand for soda is price elastic, the city government collects tax revenue of $0.75 per bottle multiplied by 70,000 bottles, or only $52,500 per day.



We can summarize the effects of a tax increase, as shown in the graph, with the following table:

	When Demand for Soda Is Price Inelastic	**When Demand for Soda Is Price Elastic**
Decline in equilibrium quantity	Smaller	Larger
Increase in equilibrium price	Larger	Smaller
Effect on discouraging soda consumption	Smaller effect	Larger effect
Effect on city tax revenue	More tax revenue collected	Less tax revenue collected

We can conclude that the tax is more effective at reducing consumption of soda when demand is price elastic and more effective at raising tax revenue for the city when demand is price inelastic.

Your Turn: For more practice, do related problems 5.2 and 5.3 at the end of this chapter.

6.6 The Price Elasticity of Supply and Its Measurement

LEARNING OBJECTIVE: Define price elasticity of supply and explain its determinants and how it is measured.

We can use the concept of elasticity to measure the responsiveness of firms to a change in price, just as we used it to measure the responsiveness of consumers. We know from the law of supply that when the price of a product increases, the quantity supplied increases. To measure how much the quantity supplied increases when price increases, we use the *price elasticity of supply*.

Measuring the Price Elasticity of Supply

Price elasticity of supply The responsiveness of the quantity supplied to a change in price, measured by dividing the percentage change in the quantity supplied of a product by the percentage change in the product's price.

As we did with the price elasticity of demand, we calculate the **price elasticity of supply** by using percentage changes:

$$\text{Price elasticity of supply} = \frac{\text{Percentage change in quantity supplied}}{\text{Percentage change in price}}.$$

Notice that because supply curves are upward sloping, the price elasticity of supply will be a positive number. We categorize the price elasticity of supply the same way we categorize the price elasticity of demand:

- If the price elasticity of supply is less than 1, then supply is *inelastic*. For example, economists have estimated that over a period of a year, the price elasticity of supply of gasoline from U.S. oil refineries is about 0.20. So, gasoline supply is inelastic: A 10 percent increase in the price of gasoline will result in only a 2 percent increase in the quantity supplied.
- If the price elasticity of supply is greater than 1, then supply is *elastic*. For example, if the price of wheat increases by 10 percent and the quantity of wheat that farmers supply increases by 15 percent, the price elasticity of supply is 1.5. So wheat supply is elastic.
- If the price elasticity of supply is equal to 1, the supply is *unit elastic*. For example, if the price of bottled water increases by 10 percent and the quantity of bottled water that firms supply increases by 10 percent, the price elasticity of supply equals 1. So, bottled water supply is unit elastic.

As with other elasticity calculations, when we calculate the price elasticity of supply, we hold constant the values of other variables.

Determinants of the Price Elasticity of Supply

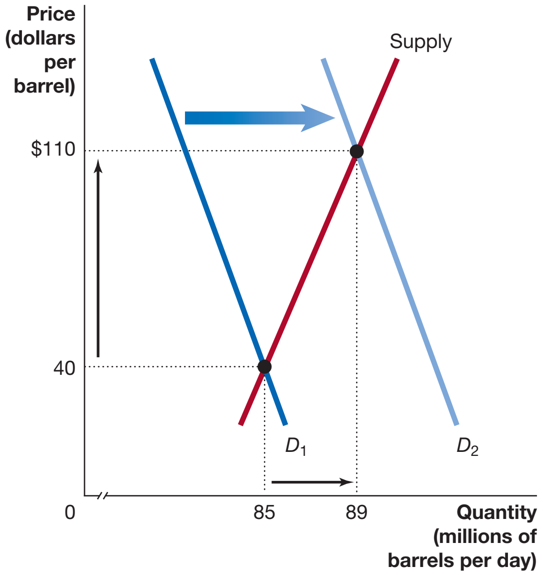
Whether supply is elastic or inelastic depends on the ability and willingness of firms to alter the quantity they produce as price increases. Often, firms have difficulty increasing the quantity of the good they supply during any short period of time. For example, a pizza restaurant cannot produce more pizzas on any one night than is possible using the ingredients in the kitchen. Within a day or two, the business can buy more ingredients, and within a few months, it can hire more cooks and install additional ovens. As a result, the supply curve for pizza and most other products will be inelastic if we measure it over a short period of time, but the supply curve will be increasingly elastic the longer the period of time over which we measure it. Products that require resources that are themselves in fixed supply are an exception to this rule. For example, a French winery may rely on a particular variety of grape. If all the land on which that grape can be grown is already planted in vineyards, then the supply of that wine will be inelastic even over a long period.

Apply the Concept

Why Are Oil Prices So Unstable?

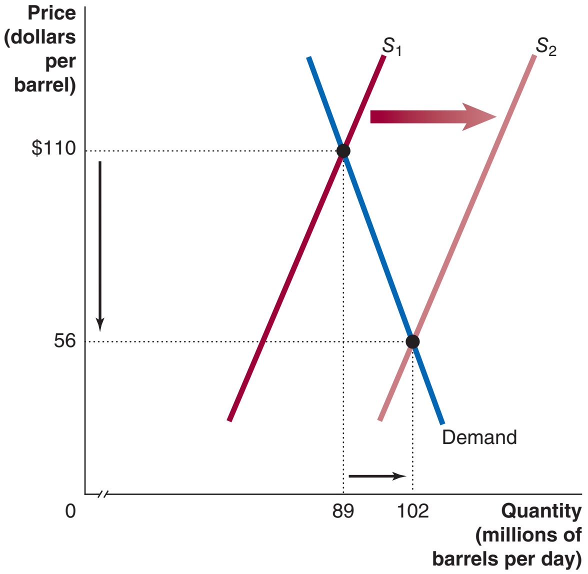
Bringing oil to market is a long process. Oil companies hire geologists to locate fields for exploratory oil well drilling. If substantial amounts of oil are present, a company begins full-scale development of the field. It can take years to advance from the exploration stage to pumping significant amounts of oil. This long process is the reason for the low short-run price elasticity of supply for oil. Because there are no close substitutes for oil, the short-run price elasticity of demand for oil is also low.

As the world economy recovered from the deep recession of 2007–2009, the demand for oil increased rapidly in a number of countries, particularly China, India, and Brazil. As the following graph shows, when supply is inelastic, an increase in demand can cause a large increase in price. The shift in the demand curve from D_1 to D_2 causes the equilibrium quantity of oil to increase by less than 5 percent, from 85 million barrels per day in 2009 to 89 million in 2011, but the equilibrium price to increase 175 percent, from \$40 to \$110 per barrel.



Since the 1970s, the world oil market has been heavily influenced by the Organization of the Petroleum Exporting Countries (OPEC). OPEC has 12 members, including Saudi Arabia, Kuwait, Iran, Venezuela, and Nigeria. Together, OPEC members own 75 percent of the world's proven oil reserves. Production of oil in the United States has increased rapidly as a result of the widespread adoption of a technology called hydraulic fracturing, or *fracking*. Fracking involves injecting a mixture of water, sand, and chemicals into a rock formation at high pressure to release oil and natural gas that could not have been recovered using traditional methods. Largely due to fracking, oil production in the United States rose from 5.6 million barrels per day in 2011 to 12.3 million in 2019, just before the start of the Covid–19 pandemic.

As the following graph shows, this expansion in U.S. production combined with greater production from some OPEC member countries caused a significant increase in the world supply of oil from 89 million barrels per day in 2011 to 102 million barrels per day in 2019. (Production in some other regions, such as the North Sea, has been declining.) The price of oil declined from $110 per barrel in 2011 to $56 in 2019. The extent of the price change reflected not only the size of the increase in supply but also the low short-run price elasticity of demand for oil.



Oil prices moved erratically during the years 2020 through 2023. The spread of Covid–19 resulted in world oil production declining from 101 million barrels per day in January 2020 to 88.1 million barrels per day in May 2020. Government restrictions on business activity decreased the demand for oil and also restricted the operation of oil fields. The price of oil declined from $64 per barrel in January to $18 per barrel in April. Through the end of 2021, supply increased but remained below 100 million barrels per day. This relatively small reduction in world oil supply was enough to cause the price of oil to rise to $87 per barrel in January 2022. The Russian attack on Ukraine in February 2022 caused a reduction in Russian oil production of about 1.2 million barrels per day, which helped to send the price of oil to $122 dollars per barrel in June. Increases in production by the United States and OPEC member countries caused the price of oil to decline to $80 per barrel in early 2023.

The combination of a low price elasticity of demand and a low price elasticity of supply means that even relatively small increases or decreases in the demand or supply of oil can result in large swings in its equilibrium price. Over the past 40 years, the price has been as low as $10 per barrel and as high as $140. These price swings are likely to continue in the future.

Your Turn: Test your understanding by doing related problems 6.4 and 6.5 at the end of this chapter.

Polar Cases of Perfectly Elastic and Perfectly Inelastic Supply

Although it occurs infrequently, supply can fall into one of the polar cases of price elasticity. If a supply curve is a vertical line, it is *perfectly inelastic*. In this case, the quantity supplied is completely unresponsive to price, and the price elasticity of supply equals zero. Regardless of how much price may increase or decrease, the quantity remains the same. Over a brief period of time, the supply of some goods and services may be perfectly inelastic. For example, a parking lot may have only a fixed number of parking spaces. If demand increases, the price to park in the lot may rise, but no more spaces will become available. Of course, if demand increases permanently, over a longer period of time, the owner of the lot may buy more land and add additional spaces or build a garage on the land.

If a supply curve is a horizontal line, it is *perfectly elastic*. In this case, the quantity supplied is infinitely responsive to price, and the price elasticity of supply equals infinity. If a supply curve is perfectly elastic, a very small increase in price causes a very large increase in the quantity supplied. Just as with demand curves, it is important not to confuse a supply curve being elastic with its being perfectly elastic and not to confuse a supply curve being inelastic with its being perfectly inelastic. Table 6.5 summarizes the different price elasticities of supply using the earlier example of 2-liter bottles of soda. (Note that the table uses the midpoint formula to calculate the elasticities.)

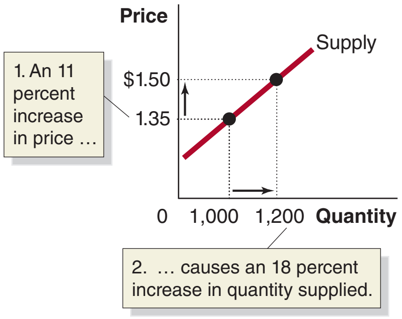
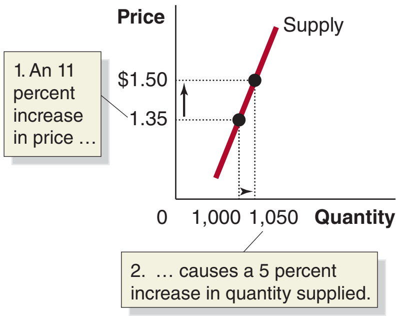
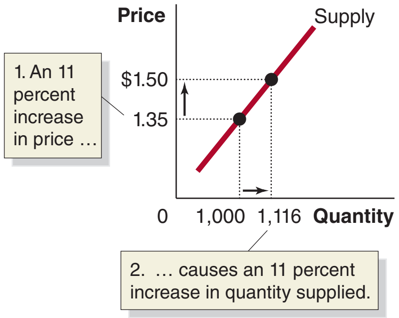
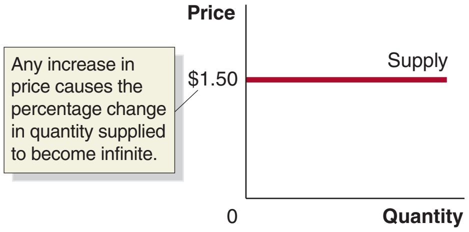
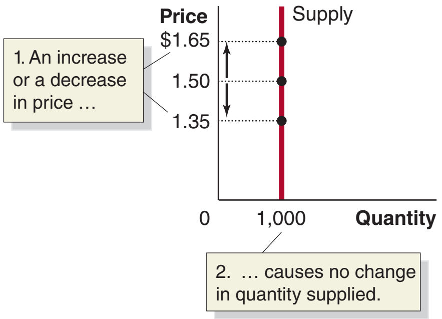
Using Price Elasticity of Supply to Predict Changes in Price

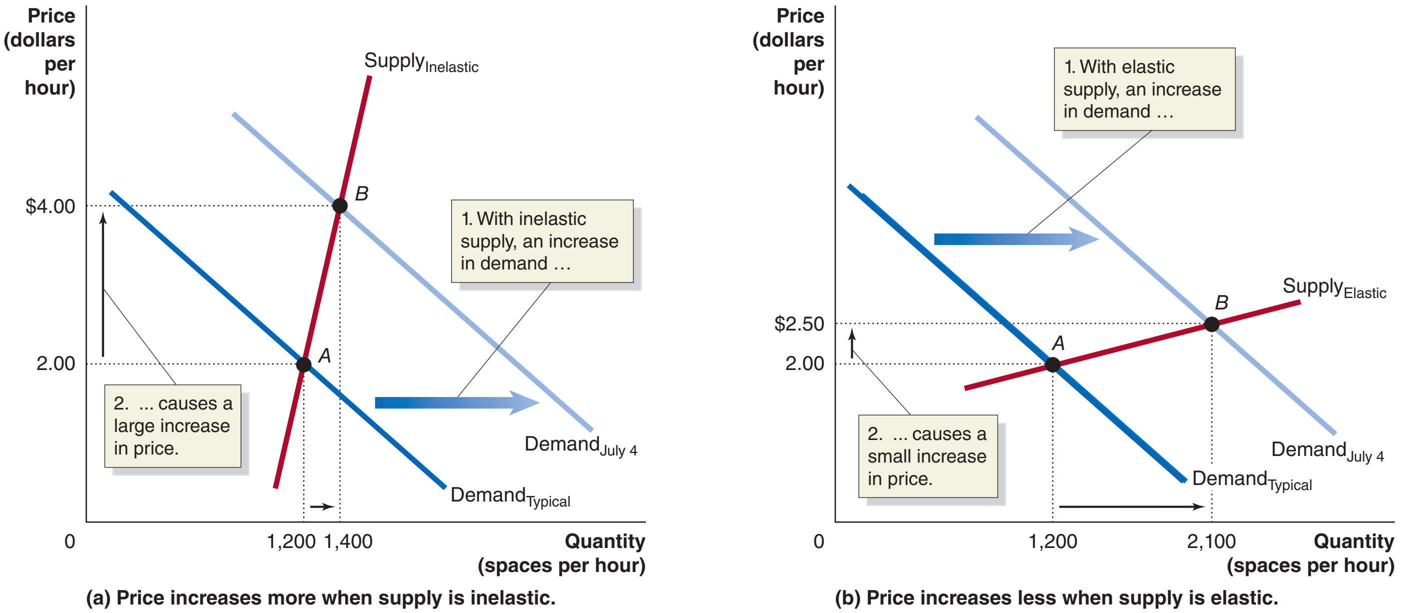
Figure 6.6 illustrates the important point that when demand increases, the amount by which price increases depends on the price elasticity of supply. The figure shows the demand and supply for parking spaces at a beach resort. In panel (a), on a typical summer weekend, equilibrium occurs at point *A*, where $\text{Demand}_{\text{Typical}}$ intersects a supply curve that is inelastic. The increase in demand for parking spaces on July 4 shifts the demand curve to the right, moving the equilibrium to point *B*. Because the resort has only a limited amount of vacant land that it can use for parking, the supply curve is inelastic, and the increase in demand results in a large increase in price—from $2.00 per hour to $4.00—but only a small increase in the quantity of spaces supplied—from 1,200 to 1,400.

In panel (b), we assume that the resort has a lot of vacant land that it can use for parking during periods of high demand, so supply is elastic. As a result, the change in equilibrium from point *A* to point *B* results in a smaller increase in price and a larger increase

Table 6.5

Summary of the Price Elasticity of Supply

If supply is ...	then the value of price elasticity is ...	
elastic	greater than 1	
inelastic	less than 1	
unit elastic	equal to 1	
perfectly elastic	equal to infinity	
perfectly inelastic	equal to 0	



(a) Price increases more when supply is inelastic.

(b) Price increases less when supply is elastic.

Figure 6.6 **Changes in Price Depend on the Price Elasticity of Supply**

In panel (a), $\text{Demand}_{\text{Typical}}$ represents the typical demand for parking spaces on a summer weekend at a beach resort. $\text{Demand}_{\text{July4}}$ represents demand on July 4. Because supply is inelastic, the shift in equilibrium from point *A* to point *B* results in a large increase in price—from $2.00 per hour to $4.00—but only a small increase in the quantity of spaces supplied—from 1,200 to 1,400. In panel (b), supply is elastic. As a result, the change in equilibrium from point *A* to point *B* results in a smaller increase in price and a larger increase in the quantity supplied. An increase in price from $2.00 per hour to $2.50 is sufficient to increase the quantity of parking supplied from 1,200 to 2,100.

in the quantity supplied. An increase in price from $2.00 per hour to $2.50 is sufficient to increase the quantity of parking spaces supplied from 1,200 to 2,100. Knowing the price elasticity of supply makes it possible to predict more accurately how much price will change following an increase or a decrease in demand.

Continued from chapter opener

Economics in Your Life & Career

Would PepsiCo and One of Its Bottlers Prefer a National or Local Soda Tax?

At the beginning of the chapter, we asked you to consider two scenarios: First, if you worked as an economist for PepsiCo, how would you evaluate the effect of a national soda tax? Second, we asked how your answer might change if you were employed by a local Pepsi bottler.

As we saw in Figure 6.2, the demand for soda is price inelastic, so although a soda tax will reduce sales of Pepsi's sweetened beverages, the effect will be smaller than it would be if the demand were price elastic. Although Pepsi's sales would decline less if soda taxes were limited to a few cities, the firm might prefer a uniform national tax rather than face widespread local taxes because a national tax would make planning easier and reduce uncertainty. A high tax in one city and a low tax in another city might end up shifting sales from one city to the other in a way that would have a negative effect on local Pepsi bottlers.

A local Pepsi bottler will have a strong preference for a uniform national tax over a local tax. If a tax in a city doesn't apply to the city's suburbs or to other neighboring towns, some consumers will switch to buying their soda outside the city limits. Because Pepsi for sale outside the city is a close substitute for Pepsi sold in the city, the demand for Pepsi in the city will be price elastic.

Conclusion

Computing elasticities is important in economics because it allows us to measure how one variable changes in response to changes in another variable. For example, by calculating the price elasticity of demand for its product, a firm can make a quantitative estimate of the effect of a price change on the revenue it receives. Similarly, by calculating the price elasticity of demand for soda, the government can better estimate the effect of an increase in soda taxes on the quantity consumed. Table 6.6 summarizes the different elasticities we discussed in this chapter.

Table 6.6

Summary of Elasticities

PRICE ELASTICITY OF DEMAND

Formula: $\dfrac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}}$

Midpoint formula: $\dfrac{(Q_2 - Q_1)}{\left(\dfrac{Q_1 + Q_2}{2}\right)} \div \dfrac{(P_2 - P_1)}{\left(\dfrac{P_1 + P_2}{2}\right)}$

	Absolute Value of Price Elasticity	Effect on Total Revenue of an Increase in Price
Elastic	Greater than 1	Total revenue falls
Inelastic	Less than 1	Total revenue rises
Unit elastic	Equal to 1	Total revenue unchanged

CROSS-PRICE ELASTICITY OF DEMAND

Formula: $\dfrac{\text{Percentage change in quantity demanded of one good}}{\text{Percentage change in price of another good}}$

Types of Products	Value of Cross-Price Elasticity
Substitutes	Positive
Complements	Negative
Unrelated	Zero

INCOME ELASTICITY OF DEMAND

Formula: $\dfrac{\text{Percentage change in quantity demanded}}{\text{Percentage change in income}}$

Types of Products	Value of Income Elasticity
Normal and a necessity	Positive but less than 1
Normal and a luxury	Positive and greater than 1
Inferior	Negative

PRICE ELASTICITY OF SUPPLY

Formula: $\dfrac{\text{Percentage change in quantity supplied}}{\text{Percentage change in price}}$

	Value of Price Elasticity
Elastic	Greater than 1
Inelastic	Less than 1
Unit elastic	Equal to 1

CHAPTER SUMMARY AND PROBLEMS

Key Terms

Cross-price elasticity of demand, p. 206
Elastic demand, p. 193
Elasticity, p. 192
Income elasticity of demand, p. 207
Inelastic demand, p. 193
Perfectly elastic demand, p. 196
Perfectly inelastic demand, p. 196
Price elasticity of demand, p. 192
Price elasticity of supply, p. 211
Total revenue, p. 201
Unit-elastic demand, p. 193

6.1 The Price Elasticity of Demand and Its Measurement

LEARNING OBJECTIVE: Define and calculate the price elasticity of demand.

Summary

Elasticity measures how much one economic variable responds to changes in another economic variable. The **price elasticity of demand** measures how responsive the quantity demanded is to changes in price. The price elasticity of demand is equal to the percentage change in the quantity demanded divided by the percentage change in price. If the quantity demanded changes more than proportionally when price changes, the price elasticity of demand is greater than 1 in absolute value, and demand is **elastic**. If the quantity demanded changes less than proportionally when price changes, the price elasticity of demand is less than 1 in absolute value, and demand is **inelastic**. If the quantity demanded changes proportionally when price changes, the price elasticity of demand is equal to 1 in absolute value, and demand is **unit elastic**. **Perfectly inelastic demand** curves are vertical lines, and **perfectly elastic demand** curves are horizontal lines. Relatively few products have perfectly elastic or perfectly inelastic demand curves.

Review Questions

1.1 Write the formula for the price elasticity of demand. Why isn't elasticity just measured by the slope of the demand curve?

1.2 If a 10 percent increase in the price of Cheerios causes a 25 percent reduction in the number of boxes of Cheerios demanded, what is the price elasticity of demand for Cheerios? Is the demand for Cheerios elastic or inelastic?

1.3 What is the midpoint formula for calculating price elasticity of demand? How else can you calculate the price elasticity of demand? What is the advantage of using the midpoint formula?

1.4 Draw a graph of a perfectly inelastic demand curve. Think of a product that would have a perfectly inelastic demand curve. Explain why demand for this product would be perfectly inelastic.

Problems and Applications

1.5 In January 2023, Tesla cut the price of its Model 3 electric car by 14 percent. A student makes the following statement: "If the demand for Model 3s is price elastic, Tesla will sell a larger quantity after the price cut. But if the demand for Model 3s is price inelastic, Tesla will sell a smaller quantity after the price cut." Briefly explain whether you agree with the student's analysis.

1.6 Jennifer Falbe of the University of California, Berkeley's School of Public Health and colleagues published an article on how taxes affect consumption of sugar-sweetened beverages (SBBs). They discussed "price elasticity of demand estimates for SSBs—the percent change in demand for SSBs resulting from a 1% increase in price." Briefly explain whether you agree with this definition of price elasticity of demand.

1.7 **[Related to the Chapter Opener]** A study of the consumption of beverages in Chile found that for soda "a price increase of 10% is associated with a reduction in consumption of 13.7%." Use this information to calculate the price elasticity of demand for soda in Chile. Is demand price elastic or price inelastic? Briefly explain.

1.8 According to an article in the *Wall Street Journal*, "In the four weeks through Sept. 1 [2018], the total number of orange juice gallons sold fell by 5.1% from the same period last year, as prices increased by 2.6%."

- **a.** Assuming that the demand for orange juice didn't shift during this period, calculate the price elasticity of demand for orange juice.
- **b.** The article also notes that the tastes of U.S. consumers have changed, and they are consuming less fruit juice partly because of its high sugar content. Does this information affect your answer to part (a)? Briefly explain.

1.9 Tea Forté, Inc. sells tea and tea mugs on Amazon.com. In December 2017, when Tea Forté cut the price of its loose-leaf tea samplers by 35 percent, it sold 6.5 times as many samplers as it did before the price cut.

- **a.** Based just on this information, what is the price elasticity of demand for Tea Forté's tea samplers?

b. After Tea Forté cut the price of its tea samplers, Amazon included the product as one of its Cyber Monday deals, featuring it in e-mail advertisements. Does this additional information affect your answer to part (a)? Briefly explain.

1.10 Suppose that the following table gives data on the price of rye and the number of bushels of rye sold in 2023 and 2024.

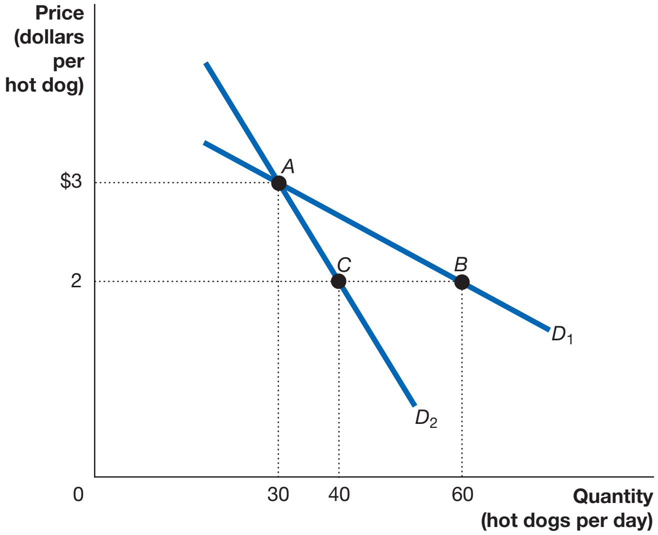
Year	Price (dollars per bushel)	Quantity (bushels)
2023	$3	8 million
2024	2	12 million

a. Calculate the change in the quantity of rye demanded divided by the change in the price of rye. Measure the quantity of rye in bushels.

b. Calculate the change in the quantity of rye demanded divided by the change in the price of rye but this time measure the quantity of rye in millions of bushels. Compare your answer to the one you computed in (a).

c. Assuming that the demand curve for rye did not shift between 2023 and 2024, use the information in the table to calculate the price elasticity of demand for rye. Use the midpoint formula in your calculation. Compare the value for the price elasticity of demand to the values you calculated in (a) and (b).

1.11 **[Related to Solved Problem 6.1]** You own a hot dog stand that you set up outside the student union every day at lunchtime. Currently, you are selling hot dogs for a price of $3 each, and you sell 30 hot dogs a day. You are considering cutting the price to $2. The following graph shows two possible increases in the quantity sold as a result of your price cut. Use the information in the graph to calculate the price elasticity of demand between these two prices on each of the demand curves. Use the midpoint formula to calculate the price elasticities.



1.12 **[Related to the Don't Let This Happen to You]** When Amazon raised the annual price to subscribe to its Amazon Prime service from $99 to $119, an article on a business website commented that "Amazon likely sees many ways to spend $2 billion in incremental revenue. (That's the additional $20 multiplied by 100 million Prime customers.)." Briefly explain whether you agree with this analysis.

1.13 An article in the *New York Times* in 2022 quotes Michelle Buck, the CEO of Hershey Foods, as saying, "In the first half of the year, we saw minimal price elasticity across our portfolio [of products]."

a. Was it likely that Hershey Foods was increasing or decreasing the prices of its products during this period? Briefly explain.

b. What did Buck mean by "minimal price elasticity"? How would she know that her products were facing minimal price elasticity? Did she need to make any assumptions to draw this conclusion? Briefly explain.

6.2 The Determinants of the Price Elasticity of Demand

LEARNING OBJECTIVE: List and explain the determinants of the price elasticity of demand.

Summary

The main determinants of the price elasticity of demand for a good are the availability of close substitutes, the passage of time, whether the good is a necessity or a luxury, how narrowly the market for the good is defined, and the share of the good in the consumer's budget.

Review Questions

2.1 What are the key determinants of the price elasticity of demand for a product? Which determinant is the most important?

2.2 Is the demand for most agricultural products elastic or inelastic? Briefly explain.

Problems and Applications

2.3 Briefly explain whether the demand for each of the following products is likely to be elastic or inelastic.

a. Milk

b. Frozen cheese pizza

c. Gasoline

d. Prescription medicine

2.4 In 2023, the subheadline of an article in the *Wall Street Journal* stated, "Tesla's aura as an elite tech disrupter dims as EV competitors multiply and improve their offerings." Did the entry of these competitors into the electric vehicle market make the demand for Tesla's vehicles more price elastic or more price inelastic? Briefly explain.

2.5 According to a news story about the bus system in the Lehigh Valley in Pennsylvania, "Ridership fell 14 percent . . . after a 33 percent increase" in bus fares. Based on this information, is the demand for bus trips price elastic or price inelastic? Explain your answer in terms of the five determinants of price elasticity.

2.6 One study found that the price elasticity of demand for soda is −0.78, while the price elasticity of demand for Coca-Cola is −1.22. Coca-Cola is a type of soda, so why isn't its price elasticity the same as the price elasticity for soda as a product?

2.7 The U.S. Energy Information Administration estimates that the price elasticity of demand for gasoline in the United States is -0.02 in the short run.
- **a.** If the estimate is accurate, what percentage increase in the price of gasoline would be required to reduce the quantity of gasoline demanded by 1 percent?
- **b.** Would you expect that the price elasticity of demand for gasoline in the long run is larger or smaller (in absolute value) than -0.02? Briefly explain.

2.8 In 2023, the entrance fee into Yellowstone National Park in northwestern Wyoming was $35 for a private, noncommercial vehicle; $30 for a motorcycle or a snowmobile; and $20 for each visitor entering on foot or riding a bicycle. The fee provides the visitor with a 7-day entrance permit into Yellowstone and nearby Grand Teton National Park.
- **a.** Would you expect the demand for entry into Yellowstone National Park for visitors in private, noncommercial vehicles to be elastic or inelastic? Briefly explain.
- **b.** There are three general ways to enter the park: in a private, noncommercial vehicle; on a motorcycle; and by foot or bicycle. Which way would you expect to have the largest price elasticity of demand, and which would you expect to have the smallest price elasticity of demand? Briefly explain.

6.3 The Relationship between Price Elasticity of Demand and Total Revenue

LEARNING OBJECTIVE: Explain the relationship between the price elasticity of demand and total revenue.

Summary

Total revenue is the total amount of funds received by a seller of a good or service. When demand is inelastic, a decrease in price reduces total revenue, and an increase in price raises total revenue. When demand is elastic, a decrease in price increases total revenue, and an increase in price decreases total revenue. When demand is unit elastic, an increase or a decrease in price leaves total revenue unchanged.

Review Questions

3.1 If the demand for orange juice is inelastic, will an increase in the price of orange juice increase or decrease the revenue that orange juice sellers receive?

3.2 In 2020, during the Covid–19 pandemic, many retail store chains, including J.C. Penney, Abercrombie & Fitch, and L Brands, closed some of their stores. An article in the *Wall Street Journal* quoted a marketing analyst as recommending that rather than close stores, "a healthier approach would be to sell fewer items and charge more for them."
- **a.** Does the marketing analyst believe that the demand for the clothes these stores sell is price elastic or price inelastic? Briefly explain.
- **b.** What does the marketing analyst expect will happen to the revenue of these stores if they follow his advice?

Problems and Applications

3.3 In recent years, increases in the number of visitors to national parks such as Yellowstone National Park and Grand Canyon National Park have resulted in over $12 billion in deferred maintenance costs. In response to the overcrowding that has contributed to the cost overruns, the National Park Service has considered limiting the number of daily visits to the parks and soliciting corporate sponsorships. Margaret Walls, a research director and senior fellow at Resources for the Future, has offered another suggestion: Increase entrance fees. But she warned: "Figuring out an efficient and fair fee structure will not be easy. It requires detailed data on visitation, for starters, as well as analysis to shed light on price elasticities of demand for different groups of visitors at different locations." Why is it important for the National Park Service to have estimates of price elasticities of demand before raising entrance fees to the national parks?

3.4 According to an article in the *Wall Street Journal*, Apple's iPhone unit sales had been falling at the same time that its revenue from selling iPhones was increasing.
- **a.** How is it possible for Apple to have increased the revenue it earned from iPhone sales if the quantity of iPhones it sold was falling?
- **b.** From this information, can you tell anything about the price elasticity of demand for iPhones? Briefly explain.

3.5 Unilever is one of the world's largest consumer products companies. In 2022, the company reported a decrease in fourth quarter sales. The decline was due, in part, to higher prices charged for its soap and ice cream products. According to an article in the *Wall Street Journal*: "The maker of Dove soap and Ben & Jerry's ice cream said sales volume fell 3.6% in the fourth quarter . . . as it increased prices by an average of 13.3%."
- **a.** Calculate the price elasticity of demand for Unilever products if a price increase of 13.3 percent results in a decrease in quantity demanded of 3.6 percent. (Assume that other variables that affect demand for Unilever products do not change.)
- **b.** Based on the value of the price elasticity of demand you calculated in part (a), is the demand for Unilever products elastic or inelastic?
- **c.** Would an increase in the price of Unilever products result in an increase or a decrease in revenue from sales of these products? Briefly explain your answer.

3.6 In August 2022, an article in the *Wall Street Journal* discussed the Disney Company increasing the prices it charges for admission to its Disneyland and Walt Disney World theme parks. As a result of the price increases, "for the quarter that ended July 2 [2022], the business unit that includes the theme parks . . . posted record revenue of $5.42 billion and record operating income of $1.65 billion." The increase in revenue occurred even though "attendance at Disney's U.S. parks fell by 17% compared with the previous year." Briefly explain what must be true of the demand for tickets to Disney's theme parks if its revenue from ticket sales increased even though 17 percent fewer tickets were sold. (For the sake of simplicity, ignore any other sources of revenue Disney earns from its theme parks apart from ticket sales.)

3.7 In July 2022, an article in the *Wall Street Journal* noted that "the chip shortage and broader supply constraints have hampered vehicle production. . . . Many major car companies on Friday reported U.S. sales declines of 15% or more for the first half of the year." But the *Wall Street Journal* also reported that carmakers were experiencing increases in revenues. For example, Ford Motor Company reported an increase in revenue even though it had sold fewer cars than during the same period in 2021.

a. Briefly explain what must be true of the demand for new cars if carmakers can increase their revenue while selling 15 percent fewer cars.

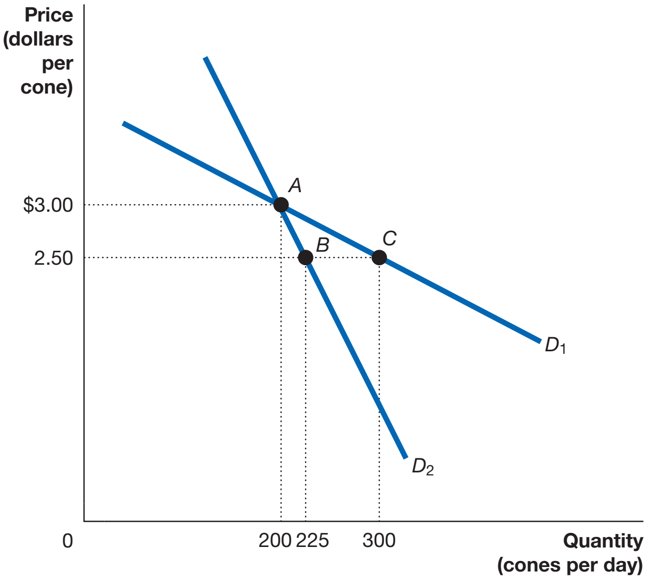
b. Eventually, the chip shortage and other supply problems facing carmakers will end. At that point, would we expect that carmakers will expand production to prepandemic levels or will they continue to produce fewer cars in order to maintain higher levels of profits? Briefly explain.

3.8 An article in the *Wall Street Journal* used the headline "Procter & Gamble, in a Strategy Shift, Moves to Raise Prices" and the subheadline "Company would seek to push through large price increases on Pampers diapers and Bounty paper towels."

a. The article notes that Pampers and Bounty are two of Procter & Gamble's (P&G's) most popular brands. Is that fact relevant to P&G's decision to raise prices? Briefly explain.

b. The article states, "As the biggest player, P&G tends to drive industrywide pricing moves." What does the article mean by "industrywide pricing moves"? Would competitors also raising their prices make the demand for Pampers more elastic or less elastic? Briefly explain.

3.9 Use the following graph for Yolanda's Frozen Yogurt Stand to answer the questions.



a. Use the midpoint formula to calculate the price elasticity of demand for D_1 between point *A* and point *C* and the price elasticity of demand for D_2 between point *A* and point *B*. Which demand curve is more elastic, D_1 or D_2? Briefly explain.

b. Suppose Yolanda is initially selling 200 cones per day at a price of $3.00 per cone. If she cuts her price to $2.50 per cone and her demand curve is D_1, what will be the change in her revenue? What will be the change in her revenue if her demand curve is D_2?

3.10 **[Related to Solved Problem 6.3]** In 2022, the Metropolitan Transportation Authority (MTA) in New York City was concerned about the decrease in revenue it was experiencing because of a decline in the number of people riding the subway. According to an article in the *New York Times*, the MTA was planning to increase the "current $2.75 base fare . . . to $2.90 by next year and to $3.02 in 2025."

a. In order for the MTA's strategy for covering its rising costs to be successful, what must be true about the price elasticity of demand for subway rides?

b. Suppose that the MTA's strategy in (a) doesn't succeed. What then must be true about the price elasticity of demand for subway rides? Draw a graph showing (1) the demand curve for subway rides, assuming that the MTA's strategy succeeds, and (2) the demand curve for subway rides, assuming that the strategy fails. For each demand curve, your graph should indicate the areas representing the revenue the MTA receives following the price increase.

3.11 **[Related to the Economics in Your Life & Career]** According to an article in the *Economist*, when Chicago enacted a 1-cent-per-ounce tax on soda, "it was introduced to protect public health but its main purpose was to plug a $1.8bn hole in the [city's] budget."

a. Did policymakers in Chicago believe that the demand for soda was price elastic or price inelastic? Briefly explain.

b. In the end, the tax raised less revenue than expected, and the tax was repealed. Did the demand for soda turn out to be more elastic or less elastic than policymakers had expected? Briefly explain.

c. Would policymakers in Chicago have been more successful in meeting their goal of discouraging people from drinking sweetened soda if the demand for soda were more elastic or more inelastic? Would they have been more successful in meeting their goal for raising more revenue for the city if the demand for soda were more elastic or more inelastic? Briefly explain in what sense the city's goals were in conflict.

3.12 **[Related to the Apply the Concept "Tesla Tests the Price Elasticity of Demand for Its Electric Vehicles"]** In 2023, shortly after Tesla announced that it would be cutting prices on its vehicles, an article on barrons.com discussed the company. The article noted that after the price cuts were announced, financial analysts forecast that Tesla's revenues would decline by about 11 percent. The article also noted that a study by BrandFinance had found that Tesla's brand was by far "the most valuable among car companies." According to BrandFinance's survey, "The public still sees Tesla as significantly more innovative and sustainable" than other car companies.

a. From this information, can we determine whether financial analysts believed that the demand for Tesla's vehicles was price elastic or price inelastic? Briefly explain what assumptions you have to make to draw this conclusion.

b. If the BrandFinance survey is correct that consumers consider Tesla to be a brand that's far better than the other car companies' brands, does this fact make it more or less likely that Tesla's price cuts would succeed in increasing the firm's revenue? Briefly explain.

3.13 The Delaware River Joint Toll Bridge Commission increased the toll from $0.50 to $1.00 on the bridges on Route 22 and Interstate 78 from New Jersey to Pennsylvania. Use the information in the following table to answer the questions. (Assume that besides the toll change, nothing occurred during these months that would have affected consumer demand.)

Number of Vehicles Crossing the Bridge			
Month	**Toll**	**Route 22 Bridge**	**Interstate 78 Bridge**
November	$0.50	519,337	728,022
December	$1.00	433,691	656,257

a. Calculate the price elasticity of demand for each bridge, using the midpoint formula.

b. How much total revenue did the commission collect from these bridges in November? How much did it collect in December? Relate your answers here to your answer in (a).

6.4 Other Demand Elasticities

LEARNING OBJECTIVE: Define and calculate the cross-price elasticity of demand and the income elasticity of demand and explain their determinants.

Summary

In addition to the price elasticity of demand, other important demand elasticities are the **cross-price elasticity of demand**, which is equal to the percentage change in the quantity demanded of one good divided by the percentage change in the price of another good, and the **income elasticity of demand**, which is equal to the percentage change in the quantity demanded divided by the percentage change in income.

Review Questions

4.1 Define *cross-price elasticity of demand*. What does it mean if the cross-price elasticity of demand is negative? What does it mean if the cross-price elasticity of demand is positive?

4.2 Define *income elasticity of demand*. How does the income elasticity of a normal good differ from the income elasticity of an inferior good? Is it possible to tell from the income elasticity of demand whether a product is a luxury good or a necessity good?

Problems and Applications

4.3 When lettuce prices doubled, from about $1.50 per head to about $3.00, the reaction of one consumer was quoted in a newspaper article: "I will not buy [lettuce] when it's $3 a head," she said, adding that other green vegetables can fill in for lettuce. "If bread were $5 a loaf we'd still have to buy it. But lettuce is not that important in our family."

a. For this consumer's household, which product has the higher price elasticity of demand: bread or lettuce? Briefly explain.

b. Is the cross-price elasticity of demand between lettuce and other green vegetables positive or negative for this consumer? Briefly explain.

4.4 A January 2023 article in the *Wall Street Journal* included the following comments about the market for beer:

> "The consumer is overly sensitive to pricing actions," Constellation Chief Executive Bill Newlands told analysts. . . . Beer has often been touted as recession-proof. . . . Budweiser brewer Anheuser-Busch NV said beer drinkers would continue to buy beer because it was a treat they could afford as other indulgences moved out of reach.

a. Constellation Brands is the third-largest beer company in the United States. If the chief executive of Constellation Brands believes consumers are "overly sensitive to pricing actions," does he believe the demand for beer is elastic or inelastic? Explain why it would it be better for beer companies if consumers were less sensitive to "pricing actions."

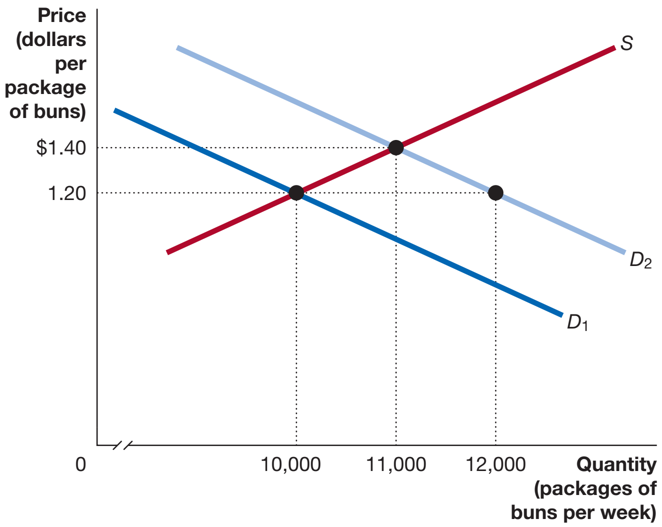
b. Consumer incomes decrease during recessions. If beer is "recession-proof," what does this imply about the income elasticity of demand for beer?

4.5 **[Related to the Chapter Opener]** A study of consumers in Chile found that the cross-price elasticity of demand between soda and milk was 0.25, while the cross-price elasticity of demand between soda and candy and other sweet snacks was 0.

a. What does the information tell us about the relationship in Chile between soda and milk? Between soda and candy? Does either result surprise you? Briefly explain.

b. If the Chilean government increases the tax on soda enough that its price increases by 10 percent, what will happen to the quantity of milk sold? What will happen to the quantity of candy sold?

4.6 In the following graph, the demand for hot dog buns has shifted to the right because the price of hot dogs has fallen from $2.20 to $1.80 per package. Use the midpoint formula to calculate the cross-price elasticity of demand between hot dogs and hot dog buns.



4.7 Are the cross-price elasticities of demand between the following pairs of products likely to be positive or negative? Briefly explain.

a. Iced coffee and iced tea
b. French fries and ketchup
c. Steak and chicken
d. Blu-ray players and Blu-ray discs

4.8 Rank the following four goods from lowest income elasticity of demand to highest income elasticity of demand. Briefly explain your ranking.

a. Bread
b. Pepsi
c. Mercedes-Benz automobiles
d. Laptop computers

4.9 **[Related to the Apply the Concept "Price Elasticity, Cross-Price Elasticity, and Income Elasticity in the Market for Alcoholic Beverages"]** The elasticities reported in this *Apply the Concept* were calculated using price data for many brands of beer. Why might price elasticity estimates be less reliable if they use data for only one brand of beer?

4.10 Consider firms selling three goods: Firm A sells a good with an income elasticity of demand less than 0; Firm B sells a good with an income elasticity of demand greater than 0 but less than 1; and Firm C sells a good with an income elasticity of demand greater than 1. In a recession when incomes fall, which firm is likely to see its sales decline the most? Which firm is likely to see its sales increase the most? Briefly explain.

6.5 Using Elasticity to Analyze the Disappearing Family Farm

LEARNING OBJECTIVE: Use price elasticity and income elasticity to analyze economic issues.

Summary

Price elasticity and income elasticity can be used to analyze many economic issues. One example is the disappearance of the family farm in the United States. Because the income elasticity of demand for food is low, the demand for food has not increased proportionally as incomes in the United States have grown. As farmers have become more productive, they have increased the supply of most foods. Because the price elasticity of demand for food is low, increasing supply has resulted in continually falling food prices.

Review Question

5.1 The demand for agricultural products is inelastic, and the income elasticity of demand for agricultural products is low. How do these facts help explain the decline of the family farm in the United States?

Problems and Applications

5.2 **[Related to Solved Problem 6.5]** According to a study by the U.S. Centers for Disease Control and Prevention, the price elasticity of demand for cigarettes is −0.25. Americans purchase about 360 billion cigarettes each year.

a. If the federal tax on cigarettes were increased enough to cause a 50 percent increase in the price of cigarettes, what would be the effect on the quantity of cigarettes demanded?

b. A recent study by Henry Saffer of City University of New York and colleagues estimated that the price elasticity of demand for electronic cigarettes (e-cigarettes) is −1.27. Why might the price elasticity of demand be higher for e-cigarettes than for conventional cigarettes? Is a tax increase of the same percentage more likely to reduce smoking of conventional cigarettes or of e-cigarettes? Briefly explain.

5.3 **[Related to Solved Problem 6.5]** Suppose that the long-run price elasticity of demand for gasoline is −0.55. Assume that the price of gasoline is currently $3.00 per gallon, the equilibrium quantity of gasoline is 140 billion gallons per year, and the federal government decides to increase the excise tax on gasoline by $1.00 per gallon. Suppose that in the long run, the price of gasoline increases by $0.70 per gallon after the $1.00 excise tax is imposed.

a. What is the new quantity of gasoline demanded after the tax is imposed? How effective would a gas tax be in reducing consumption of gasoline in the long run?

b. How much does the federal government receive from the tax?

5.4 According to an article in the *Wall Street Journal*, "Farm incomes have slid despite record productivity on American farms." Shouldn't the ability of farmers to grow more crops per acre of land, as indicated by rising farm productivity, increase the income of farmers rather than lower it? How can you resolve this apparent paradox?

5.5 Corruption has been a significant problem in Iraq. Opening and running a business in Iraq usually involves paying bribes to multiple government officials. We can think of there being a demand and supply for bribes, with the curves having the usual shapes: The demand for bribes will be downward sloping because the smaller the bribe, the more business owners will be willing to pay it. The supply of bribes will be upward sloping because the larger the bribe, the more government officials will be willing to run the risk of breaking the law by accepting the bribe. Suppose that the Iraqi government introduces a new policy to reduce corruption that raises the cost to officials of accepting bribes—perhaps by increasing the jail term for accepting a bribe. As a result, the supply curve for bribes will shift to the left. If we measure the burden on the economy from corruption by the total value of the bribes paid, what must be true of the demand for bribes if the government policy is to be effective? Illustrate your answer with a demand and supply graph. Be sure to show on your graph the areas representing the burden of corruption before and after the government policy is enacted.

5.6 Assume that the head of the United Kumquat Growers Association makes the following statement:

> The federal government is considering implementing a price floor in the market for kumquats. The government will not be able to buy any surplus kumquats produced at the price

floor or to pay us any other subsidy. Because the demand for kumquats is elastic, I believe this program will make us worse off, and I say we should oppose it.

Explain whether you agree with this reasoning.

5.7 Review the concept of economic efficiency from Chapter 4 before answering the following question: Will there be a greater loss of economic efficiency from a price ceiling when demand is elastic or inelastic? Illustrate your answer with a demand and supply graph.

6.6 The Price Elasticity of Supply and Its Measurement

LEARNING OBJECTIVE: Define price elasticity of supply and explain its determinants and how it is measured.

Summary

The **price elasticity of supply** is equal to the percentage change in quantity supplied divided by the percentage change in price. The supply curves for most goods are inelastic over a short period of time, but they become increasingly elastic over longer periods of time. Perfectly inelastic supply curves are vertical lines, and perfectly elastic supply curves are horizontal lines. Relatively few products have perfectly elastic or perfectly inelastic supply curves.

Review Questions

6.1 Write the formula for the price elasticity of supply. If an increase of 10 percent in the price of frozen pizzas results in a 9 percent increase in the quantity of frozen pizzas supplied, what is the price elasticity of supply for frozen pizzas? Is the supply of pizzas elastic or inelastic?

6.2 What is the main determinant of the price elasticity of supply?

Problems and Applications

6.3 To legally operate a taxi in New York City, a driver must have a medallion issued by the New York City Taxi and Limousine Commission, an agency of the city's government. In 2023, the number of medallions was 13,587—a number that has remained unchanged since 1937. In recent years, the taxi industry in New York and other large cities has encountered competition from companies such as Uber and Lyft, app-based ride-hailing services that offer rides from drivers who own their own cars. Uber uses *surge pricing*, under which it varies the prices it charges based on the demand for rides, with rides during busier periods, such as Saturday nights, having higher prices. In 2023, there were more than 75,000 cars in New York City offering rides through ride-hailing apps.

- **a.** What does the limitation on the number of taxi medallions imply about the price elasticity of supply of medallions?
- **b.** Does surge pricing make the supply of Uber rides more or less elastic than it would be if prices were fixed, the way they are for taxi rides? Briefly explain.
- **c.** Beginning in 2021, the New York City government's Taxi and Limousine Commission required that drivers for Uber and Lyft have a license issued by the commission. The companies stopped accepting new drivers because of limits on the number of licenses and the minimum pay requirement for drivers that the city government had enacted. What effect are these developments likely to have on the price of Uber and Lyft rides in New York City? Who benefits and who loses from this change in how the ride-hailing market in New York City operates?

6.4 **[Related to the Apply the Concept "Why Are Oil Prices So Unstable?"]** An article in the *Wall Street Journal* in 2019 noted that oil prices had increased to a 3-month high following an agreement by Russia and the members of OPEC to reduce their oil production by a combined 1.2 million barrels per day. World oil production is over 100 million barrels per day. How could such a small decrease in supply lead to a substantial increase in equilibrium price in the oil market?

6.5 **[Related to the Apply the Concept "Why Are Oil Prices So Unstable?"]** Suppose that instead of being highly inelastic, the demand for oil is highly elastic.

- **a.** Given the situation illustrated by the first graph in the *Apply the Concept*, would the resulting price change be larger, smaller, or the same as the actual price change shown in the graph? Briefly explain.
- **b.** Given the situation illustrated by the second graph in the *Apply the Concept*, would the resulting price change be larger, smaller, or the same as the actual price change shown in the graph? Briefly explain.

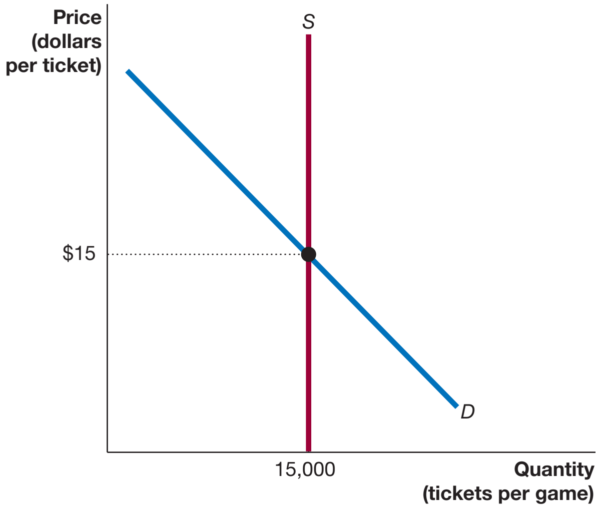
6.6 Use the midpoint formula for calculating elasticity to calculate the price elasticity of supply between point *A* and point *B* for *each* panel of Figure 6.6.

6.7 A majority of the world's chocolate is made from cocoa beans grown in the African countries of Ghana and Côte d'Ivoire. It can take 2 to 4 years for new trees to produce the pods in which the beans are grown. An article on bloomberg.com in late 2022 noted that demand for chocolate "will rebound to pre-pandemic levels during the first festive season in three years without widespread Covid restrictions." Following a permanent increase in the world demand for chocolate, all else equal, would you expect the price of chocolate to be greater after 1 year or after 4 years? Use a graph to illustrate your answer.

6.8 Suppose that on most days, the price of a rose is \$1, and 8,000 roses are purchased. On Valentine's Day, the price of a rose jumps to \$2, and 30,000 roses are purchased.

- **a.** Draw a demand and supply graph that shows why the price jumps.
- **b.** Based on this information, what do we know about the price elasticity of demand for roses? What do we know about the price elasticity of supply for roses? Calculate values for the price elasticity of demand and the price elasticity of supply or explain why you can't calculate these values.

6.9 Use the following graph of the market for basketball tickets at State University to answer the questions.



a. What is the price elasticity of supply in this case?

b. Suppose the basketball team at State University goes undefeated in the first half of the season, and the demand for basketball tickets increases. Show the effects of this increase in demand on the graph. What happens to the equilibrium price and quantity of tickets? Briefly explain.

c. If the State University basketball team continues to do very well in future years, what is likely to happen to the price elasticity of supply of tickets to its games? Briefly explain.

Critical Thinking Exercises

CT6.1 Survey a group of 10 people and find *one* good that all of them purchase each month. That common good might be pizza, coffee, bottled water, or gasoline. Ask each person three questions about that good: (1) Roughly what is the current price you pay for the good? (2) How much of the good do you consume each month? and (3) How much of the good would you consume if the price of the good doubled? Enter the data you gathered in a spreadsheet and use the midpoint formula (Section 6.1) to estimate this group's elasticity of demand for the good. Does your result make sense to you? Briefly explain.

CT6.2 From the following tables, what types of elasticity can you calculate? Briefly explain.

Quantity of Gasoline an Average Consumer Purchases per Month	Price of Gasoline	Income per Month of the Average Consumer
100 gallons	$2.50	$4,000
120 gallons	$2.60	$4,500

Quantity of Gasoline an Average Consumer Purchases per Month	Price of Gasoline	Income per Month of the Average Consumer
100 gallons	$2.60	$4,000
120 gallons	$2.60	$4,500

7 The Economics of Health Care

Covid–19 and the U.S. Health Care System

The Covid–19 pandemic presented the U.S. health care system with its greatest challenge since the 1918 influenza pandemic. The U.S. health care system's performance relative to that of other high-income countries was mixed. In late 2023, total deaths in the United States per million population were higher than in nearly all other high-income countries. It was unclear, however, to what extent the higher death rate was attributable to problems with the U.S. health care system or to factors such as (1) flawed government policies; (2) the U.S. population having a larger fraction of people who were at greater risk of dying from the disease; or (3) differences across countries in how Covid–19 deaths are counted.

A strength of the U.S. health care system was the speed with which U.S.-based pharmaceutical firms Pfizer, Moderna, and Johnson & Johnson developed effective vaccines that helped to end the worst of the pandemic. (Note that Pfizer partnered with the German pharmaceutical firm BioNTech in creating its vaccine.) Pfizer and Moderna also quickly updated their vaccines to deal with variants of the Covid–19 virus that appeared during 2022.

Only a small percentage of people in the United States receive medical care from a doctor who works for the government or at a government-owned hospital. Federal, state, and local governments play significant roles in providing or subsidizing *health insurance* but much smaller roles in directly providing health care to individuals. About 39 percent of people in the United States receive government-sponsored or subsidized health insurance from the following five programs: (1) Medicare, which provides health insurance to people aged 65 and older; (2) Medicaid, which funds health care for people with low incomes; (3) Tricare, the federal government's program for providing health insurance to current members of the military; (4) the program run by the Veterans Health Administration, which provides health care to some military veterans; and (5) the Affordable Care Act (ACA), which provides income-based subsidies to people buying individual health insurance policies. The ACA is sometimes called "Obamacare" because Congress passed it in 2010, during the administration of President Barack Obama.

Scott Eisen/Bloomberg/Getty Images

In 2023, many more people in the United States were enrolled in insurance plans run by private health insurance companies than in government-run plans like Medicare. These people either buy individual policies, as they would buy automobile insurance or homeowners insurance, or they enroll in plans offered through their employers. The best-known health insurance plans are offered by the companies in the Blue Cross and Blue Shield systems.

Some members of Congress have proposed a program called "Medicare for All" that would establish a system under which the federal government would pay for all medical care, eliminating private health insurance plans. Supporters of Medicare for All argued that the Covid–19 pandemic highlighted the need for the United States to adopt a more centralized health care system that they believe would be better equipped to deal with pandemics and other health crises.

President Joe Biden, however, does not support Medicare for All. He has instead proposed a "public option" that would allow individuals younger than 65 to enroll in a government-run plan that would be similar to Medicare. As of late 2023, Congress had not enacted a public option for Medicare. The Covid–19 pandemic highlighted that the debates involving health care policy are complex and difficult to resolve.

Chapter Outline & Learning Objectives

7.1 The Improving Health of People in the United States, page 228
Use data to discuss trends in U.S. health over time.

7.2 Health Care around the World, page 232
Compare the health care systems and health care outcomes in the United States and other countries.

7.3 Information Problems and Externalities in the Market for Health Care, page 239
Define information problems and externalities and explain how they affect the market for health care.

7.4 The Debate over Health Care Policy in the United States, page 245
Explain the major issues involved in the debate over health care policy in the United States.

Economics in Your Life & Career

Is Your Take-Home Pay Affected by What Your Employer Spends on Your Health Insurance?

If you work for a firm that offers health insurance, the firm will withhold some amount from each of your paychecks to pay for the insurance. Typically, firms pay the majority of the cost of health insurance for their employees. In 2022, on average, employees paid only 17 percent of the cost of coverage for themselves or 28 percent of the cost of coverage for their family. Your paycheck probably doesn't show the amount your employer pays on your behalf for health insurance, but does that amount affect your take-home pay? As you read this chapter, try to answer this question. You can check your answer against the one we provide at the end of this chapter.

Health care Goods and services, such as prescription drugs, consultations with doctors, and surgeries, that are intended to maintain or improve a person's health.

Health care refers to goods and services, such as prescription drugs, consultations with doctors, and surgeries, that are intended to maintain or improve a person's health. Health care makes up more than one-sixth of the U.S. economy—about the size of the entire economy of France. Improvements in health care are an important part of the tremendous increase in living standards people in the United States and other high-income countries have experienced over the past 100 years. Health care has seen rapid technological change, with new products, including diagnostic equipment such as MRI units and CT scanners; prescription drugs to treat cancer, high blood pressure, diabetes, and AIDS; vaccinations for illnesses such as meningitis and Covid–19; and new surgical techniques, such as cardiac catheterizations for treatment of heart disease.

Health care is provided through markets, just as are most other goods and services, such as smartphones and haircuts. So, we can apply to health care the tools of economic analysis we used in previous chapters. But the government plays a larger role in the market for health care than it does in other markets. In the United States, the doctors and hospitals that supply most health care are primarily private firms, but the government provides some health care services directly through the Veterans Health Administration, which is part of the U.S. Department of Veterans Affairs, and indirectly through the Medicare and Medicaid programs. And, under the **Affordable Care Act (ACA)**, the government regulates the health insurance policies that private insurance companies offer.

Affordable Care Act (ACA) Health care reform legislation passed by Congress and signed by President Barack Obama in 2010.

In addition to the large role the government plays, the market for health care differs from most other markets in several ways. Most importantly, a typical consumer of health care doesn't pay the full price for that care. Most people have private health insurance, either provided through their employers or purchased on the government-run health insurance marketplaces, or they are enrolled in the Medicare or Medicaid programs. Consumers who have insurance make different decisions about the quantity of health care they wish to consume than they would if they were paying the full cost of the services. So, to analyze the market for health care, we need to use economic tools beyond those introduced in previous chapters. We begin our analysis of health care by looking at how the health of people in the United States has changed over the years.

7.1 The Improving Health of People in the United States

LEARNING OBJECTIVE: Use data to discuss trends in U.S. health over time.

Two hundred years ago, the whole world was very poor by modern standards. Today, an average person in a high-income country has a standard of living well beyond what even the richest people in the past could have imagined, thanks in part to improved health. In this section, we discuss the improving health of people in the United States. In Section 7.2, we compare the health care systems in the United States and other countries.

Changes over Time in U.S. Health

When economists measure changes over time in the standard of living in a country, they usually look first at increases in income per person. However, changes in health are also important because health is an essential part of a person's well-being and, therefore, of his or her standard of living. The health of the average person in the United States improved significantly during the 1800s and 1900s, and by and large, it continues to improve today.

Table 7.1 compares three indicators of health in the United States in 1850 and today. Individuals in the United States today are taller, live much longer, and are much less likely to die in the first months of life than was true 170 years ago. (Note that the value of 76.1 years for life expectancy in the table is for 2021 and represented a decline of 2.7 years

Table 7.1

Health in the United States, 1850 and Today

Variable	1850	Today
Life expectancy at birth	38.3 years	76.1 years
Average height (adult males)	5′ 5″	5′ 7″
Infant mortality (death of a child under 1 year of age)	228.9 per 1,000 live births	5.4 per 1,000 live births

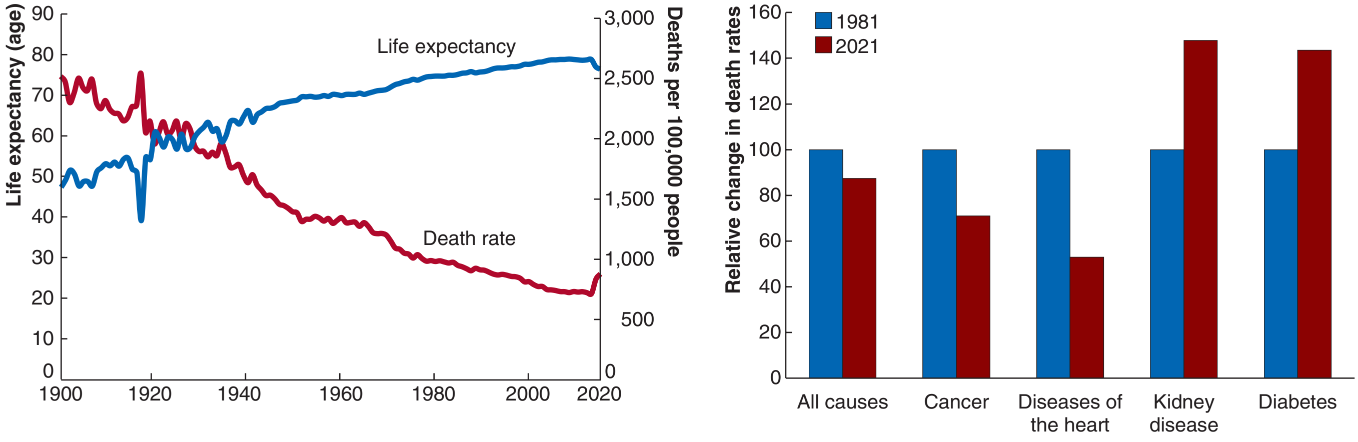
Note: The data on height for 1850 include only native-born white and black male citizens. The data on height today were gathered in 2015–2016 and represent the median height of adult males 20 years and older.

Sources: Susan B. Carter, Scott Sigmund Gartner, Michael R. Haines, Alan L. Olmstead, Richard Sutch, and Gavin Wright eds., *Historical Statistics of the United States: Millennial Edition Online*, hsus.cambridge.org; National Center for Health Statistics, "Anthropometric Reference Data, for Children and Adults: United States, 2015–2018," *Vital and Health Statistics*, Vol. 3, No. 46, January 2021; and Centers for Disease Control and Prevention, *National Vital Statistics Reports*, various issues.

since 2019 and the lowest value since 1996. The decline in life expectancy was largely due to the effects of the Covid–19 pandemic.) Economists often use height as a measure of long-run changes in the average well-being of a population. A person's height depends partly on genetics—that is, tall parents tend to have tall children—but also on a person's *net nutritional status*. Net nutritional status depends on a person's food intake relative to the work the person has to perform, whether the person is able to remain warm in cold weather, and the diseases to which the person is exposed. Over time, people in the United States have, on average, become taller, which indicates that their nutritional status has improved.

Reasons for Long-Run Improvements in U.S. Health

For most of the country's history, the health of people in the United States has steadily improved, with life expectancies increasing and death rates decreasing. Panel (a) of Figure 7.1 shows for the years 1900–2021 the increase in life expectancy and the decline in the mortality rate, or death rate, measured as deaths per 100,000 people. Note that the



(a) Life expectancy at birth and the death rate per 100,000 people in the United States

(b) Changes in mortality rates

Figure 7.1 **The Improving Health of the U.S. Population**

Panel (a) shows that since 1900, life expectancy has increased and mortality rates have decreased in the United States. Panel (b) shows that since 1981, there have been significant decreases in rates of death due to cardiovascular diseases and cancer. Rates of death due to kidney disease and diabetes have increased, primarily because of an increase in obesity. Note that in panel (a), the increase in mortality and decrease in life expectancy in 1918 are due to the influenza pandemic of that year, and the increase in mortality and decrease in life expectancy during 2020 and 2021 are due to the Covid–19 pandemic.

Sources: For panel (a): Susan B. Carter, Scott Sigmund Gartner, Michael R. Haines, Alan L. Olmstead, Richard Sutch, and Gavin Wright eds., *Historical Statistics of the United States: Millennial Edition Online*, hsus.cambridge.org, Series Ab644; and Centers for Disease Control and Prevention, *National Vital Statistics Reports*, various issues; for panel (b): Centers for Disease Control and Prevention, *National Vital Statistics Reports*, various issues; and Jiaquan Xu, Sherry L. Murphy, Kenneth D. Kochanek, and Elizabeth Arias, "Mortality in the United States, 2021," *NCHS Data Brief*, No. 456, December 2022.

mortality rate is "age adjusted," which means that it is not affected by changes in the number of people in each age group. Life expectancy at birth in the United States increased from 47.3 years in 1900 to 76.1 years in 2021. Although panel (a) shows that over the long run, life expectancy in the United States has increased, it declined slightly between 2014 and 2019, before declining sharply during the Covid–19 pandemic. Research by Angus Deaton and Anne Case of Princeton University indicates that prior to the pandemic, the main cause of the decline was falling life expectancy among non-Hispanic whites who did not attend college. They note that for this group, there has been an increase in "deaths of despair" due to alcoholism, overdosing from opioids, and suicide.

Panel (b) shows the change from 1981 to 2021 in the overall mortality rate of the U.S. population, measured as deaths per 100,000 people, and the age-adjusted mortality rates for several diseases. In panel (b), the mortality rates in 1981 are set equal to 100, and the rates for 2021 are measured relative to their 1981 levels. The overall mortality rate decreased by about 13 percent between 1981 and 2021. Over this same period, deaths from cancer and heart disease declined significantly. Cancer deaths were 29 percent lower in 2021 than they were in 1981, while deaths from heart disease declined by 47 percent. Deaths from diabetes and kidney disease both increased during this period, largely due to the effects of increasing obesity. The overall decline in death rates in the United States since 1981 has been due to changes in lifestyle, particularly a decline in smoking, and advances in new diagnostic equipment, prescription drugs, and surgical techniques.

What explains increases in life expectancy and declines in death rates over the longer time span since 1850? Improvements in sanitation and in the distribution of food during the late 1800s and early 1900s led to better health during that period. More generally, the late Nobel Laureate Robert Fogel of the University of Chicago and Roderick Floud of Gresham College in England, along with coauthors, described a process by which better health makes it possible for people to work harder as they become, on average, taller, stronger, and more resistant to disease. Working harder raises a country's total income, making it possible for the country to afford better sanitation, more food, and a better system for distributing the food. In effect, improving health shifts out a country's production possibilities frontier. Higher incomes also allow the country to devote more resources to research and development, including medical research. The United States has been a pioneer in the development of medical technology, new surgical techniques, and new pharmaceuticals, which have played important roles in lengthening life spans and reducing the death toll from diseases.

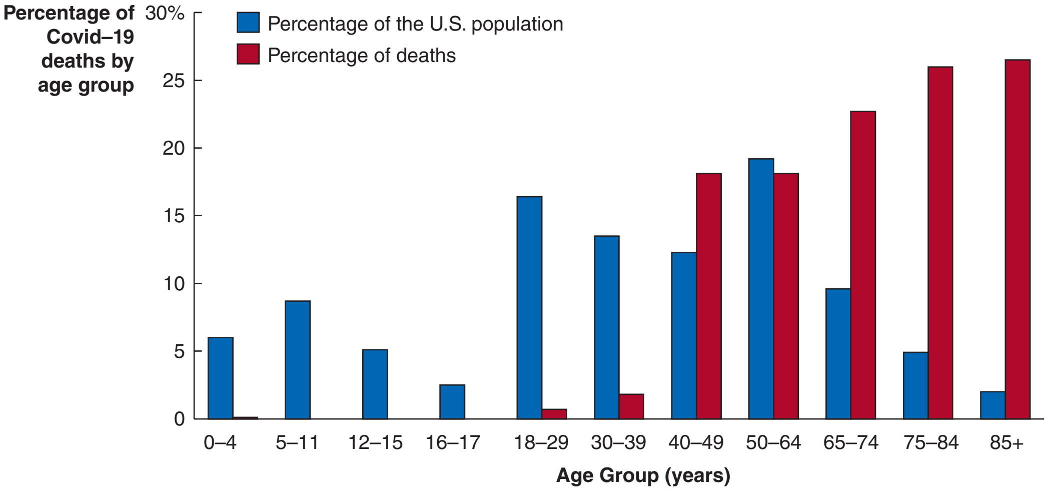
Apply the Concept

The Demographics of Covid–19 Mortality

As we saw in panel (a) of Figure 7.1, the effects of the 1918 influenza pandemic and the Covid–19 pandemic that began in 2020 were so severe that they significantly increased U.S. death rates and decreased U.S. life expectancy. Let's look more closely at the demographics of Covid–19 mortality.

Few diseases affect all demographic groups equally. For example, the 1918–1919 influenza pandemic killed an unusually large number of young adults. Estimates are that half of deaths in the United States during that pandemic occurred among people 20 to 40 years of age. In contrast, during recent flu seasons, individuals who are elderly or very young have had much higher mortality rates than have other age groups. For instance, during the 2019–2020 flu season, people 65 years and older died at a rate more than 10 times greater than people 18 to 49 years of age. In 2019–2020, children 0 to 4 years of age died at a rate four times higher than children 5 to 17 years of age.

The Covid–19 virus began to spread widely in the United States in the spring of 2020. Over two years later, in the fall of 2022, hundreds of people in the United States were still dying of the virus each week. Some epidemiologists expected Covid–19 to affect different demographic groups in about the same way as the flu does. In fact, though, while people 65 and older were particularly at risk, young children were less affected by Covid-19 than they are by the flu. The following graph uses data from the Centers for Disease Control and Prevention (CDC) and shows Covid–19 deaths in the United States by age group as of October 2022.



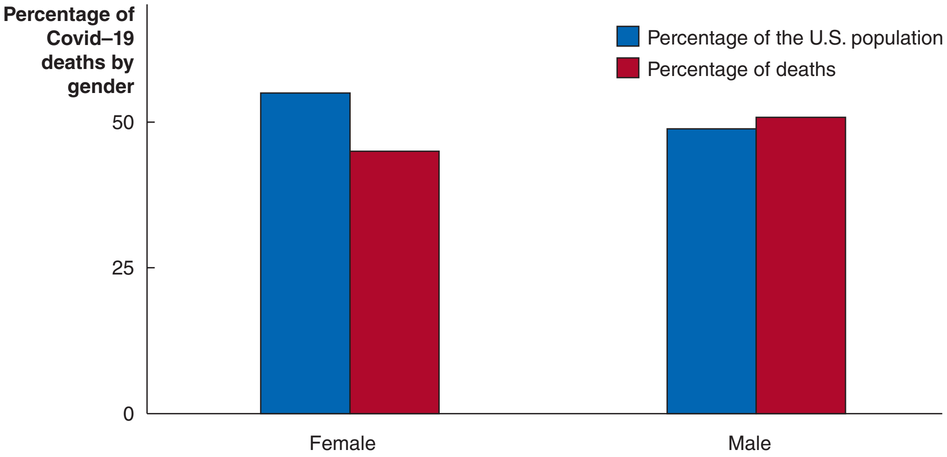
Source: Adapted from cdc.gov.

The red bars show the percentage of total deaths from Covid–19 since the beginning of the pandemic that occurred in each age group. The blue bars show the percentage of the total U.S. population for each age group. Therefore:

- An age group that has a blue bar longer than its red bar was proportionally *less* affected by the virus.
- An age group that has a red bar longer than its blue bar was proportionally *more* affected by the virus.

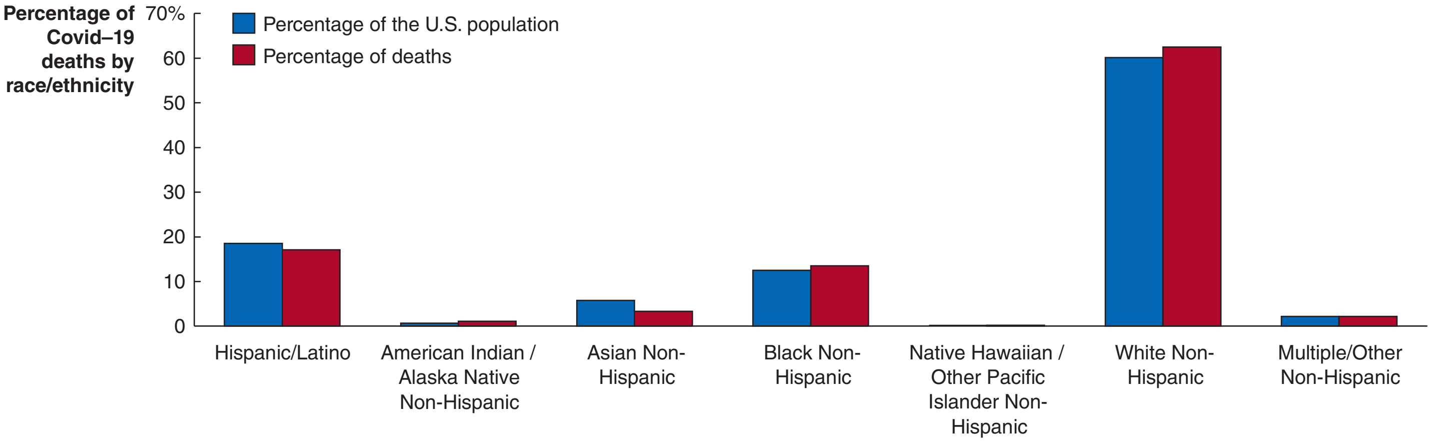
The graph shows that people over age 65 experienced particularly high mortality rates. Strikingly, people over age 85 accounted for nearly 27 percent of all Covid–19 deaths in the United States, while making up only 2 percent of the U.S. population.

The following graph displays data on Covid–19 deaths by gender. Men account for about 49 percent of the U.S. population but have accounted for about 55 percent of Covid–19 deaths.



Source: Adapted from cdc.gov.

Finally, the following figure displays data on Covid–19 deaths by race or ethnicity. Black, white, and American Indian or Alaskan Native people have experienced proportionally higher Covid–19 mortality rates than have Hispanic or Asian people.



Source: Adapted from cdc.gov.

What explains the disparity in mortality rates across demographic groups? With respect to age, we would expect older people to have weaker immune systems and therefore be more likely to die from any illness. In addition, early in the pandemic, many older people in nursing homes died of Covid–19 before it was widely understood that the disease spread through aerosols and that keeping people close together inside and unmasked made it easy for the virus to spread. Very young people have immature immune systems, which might have made them particularly susceptible to Covid–19, but that was not the case—for reasons not yet fully understood.

Debate continues over why men have experienced a higher mortality rate from Covid–19 than women. Vaccination rates among men are somewhat lower than among women, which may account for part of the difference. In an opinion column in the *New York Times*, Dr. Ezekiel Emanuel of the University of Pennsylvania noted that researchers at Yale University have observed "that there are well-established differences in immune responses to infections between men and women." But it remains unclear why this pattern should be reflected in Covid–19 deaths.

Medical researchers and epidemiologists have also not arrived at a consensus in explaining differences in mortality rates across racial or ethnic groups. Groups with higher mortality rates have had lower vaccination rates, which explains some of the difference. Groups with higher mortality rates are also more likely to suffer from other conditions, such as hypertension, that have been identified as contributing factors in some Covid–19 deaths. These groups are also less likely to have access to health care than are the groups with lower mortality rates. The CDC notes that: "Race and ethnicity are risk markers for other underlying conditions that affect health, including socioeconomic status, access to health care, and exposure to the virus related to occupation, e.g., frontline, essential, and critical infrastructure workers."

Your Turn: Test your understanding by doing related problem 1.3 at the end of this chapter.

7.2 Health Care around the World

LEARNING OBJECTIVE: Compare the health care systems and health care outcomes in the United States and other countries.

In the United States, private firms provide most health care, through either doctors' practices or hospitals. The main exception is the care the government provides through the network of hospitals operated by the federal government's Veterans Health Administration, although some cities also own and operate hospitals. Governments in most countries outside the United States have a more substantial direct role in paying for or providing health care. Policymakers and economists debate the effects of greater government involvement in the health care system on health outcomes such as life expectancy, infant mortality, and successful treatment of diseases.

The U.S. Health Care System

One important difference among health care systems in different countries is the way people pay for their health care. Most people in the United States have *health insurance* that helps them pay their medical bills. **Health insurance** is a contract under which a buyer agrees to make payments, or *premiums*, in exchange for the provider's agreeing to pay some or all of the buyer's medical bills. Figure 7.2 shows the sources of health insurance in the United States in 2021. About 49 percent of people received health insurance through their employer, and about 6 percent directly purchased an individual or family health insurance policy from an insurance company, often using the state health insurance marketplaces Congress established under the Affordable Care Act. About 37 percent of people received health insurance through a government program, such as Medicaid, Medicare, or Tricare.

Health insurance A contract under which a buyer agrees to make payments, or *premiums*, in exchange for the provider's agreeing to pay some or all of the buyer's medical bills.

Most people who have private health insurance receive it through their employer. According to a Kaiser Family Foundation survey of employers, in 2022, 99 percent of firms employing 200 or more workers and 51 percent of all firms offered their employees health insurance as a fringe benefit (that is, a type of non-wage compensation). Private health insurance companies can be either not-for-profit firms, such as some of the Blue Cross and Blue Shield organizations, or for-profit firms, such as Humana, Aetna, and John Hancock, which typically also sell other types of insurance. Private health insurance companies sell *group plans* to employers to cover all of their employees and sell individual plans directly to the public. Some health insurance plans reimburse doctors and hospitals on a **fee-for-service** basis, which means that doctors and hospitals receive a payment for each service they provide. Other health insurance plans are organized as *health maintenance organizations (HMOs)*, which typically reimburse doctors by paying a flat fee per patient rather than paying a fee for each individual office visit or other service provided.

Fee-for-service A system under which doctors and hospitals receive a payment for each service they provide.

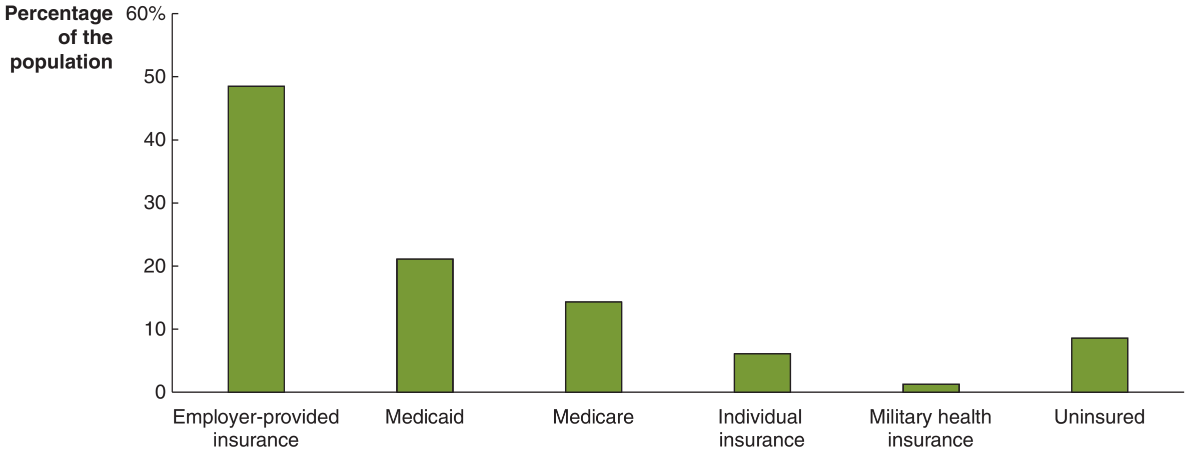


Figure 7.2 **Sources of Health Insurance in the United States, 2021**

In 2021, about 49 percent of people received health insurance through their employer, and about 6 percent directly purchased an individual or family health insurance policy from an insurance company. About 37 percent of people received health insurance through a government program, such as Medicaid, Medicare, or Tricare. About 9 percent of people were uninsured.

Source: Kaiser Family Foundation, "Health Insurance Coverage of the Total Population," kff.org.

About 9 percent of people were not covered by health insurance in 2021. This percentage represented more than 27 million uninsured people. There are a variety of reasons people do not have health insurance:

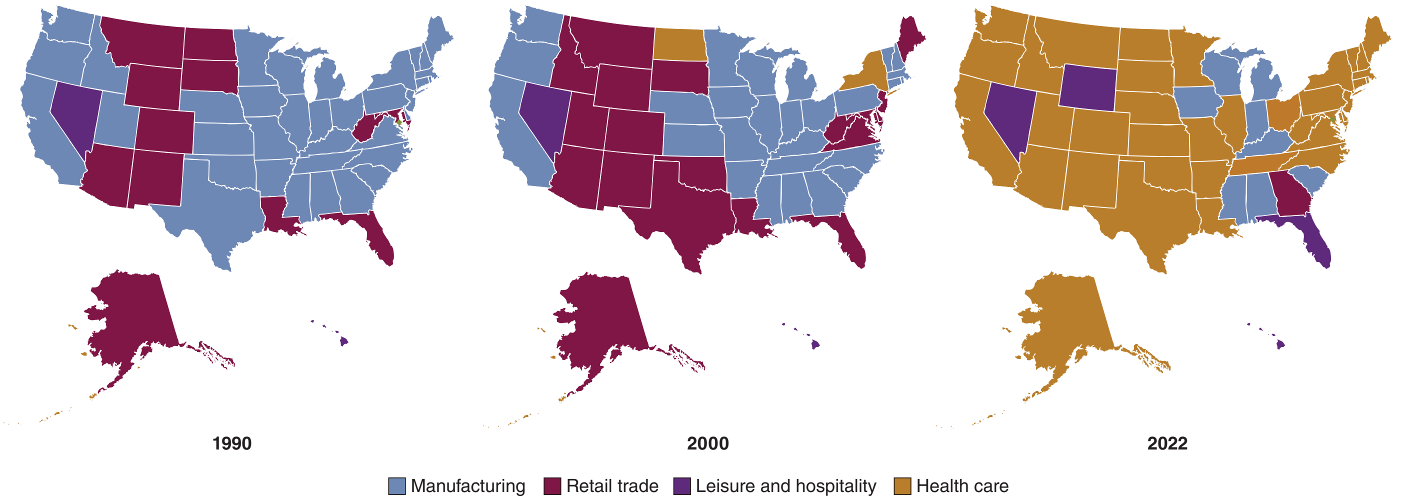
- More than half of uninsured people in the United States are under age 35. Some have opted out of employer-provided health insurance because they are healthy and do not believe that the cost of the premium their employer charges for the insurance is worth the benefit of having it.
- Some people have low incomes and believe they cannot afford to buy private health insurance—even with government subsidies.
- Some people may not qualify for Medicaid or choose not to participate in that program.
- About 70 percent of uninsured people live in families in which at least one member has a full-time job. These individuals either were not offered health insurance through their employers or chose not to purchase it.
- Fewer than two-thirds of employees accept health insurance offered through their employer, typically because they are already covered under a spouse's policy or don't want to pay the premium for the insurance.

Uninsured people must pay for their own medical bills *out of pocket*—that is, with money from their own income—just as they pay their other bills. Sometimes they receive care from doctors or hospitals either for free or below the normal price.

Apply the Concept

The Increasing Importance of Health Care in the U.S. Economy

When you graduate from college, you are much more likely than your parents or grandparents were to get a job in health care. There are many types of jobs in health care, from doctors and nurses to managers at hospitals and nursing homes to researchers and salespeople at pharmaceutical firms. As the following maps show, in 1990, manufacturing was the largest source of private employment in most states, and in no state was health care the largest employer. By 2000, manufacturing was still the largest employer in 27 states, but health care had become the largest employer in 2 states. The results for 2022 are strikingly different: Manufacturing was the largest employer in only 8 states, and health care was the largest employer in 37 states.



In 1990, almost twice as many people in the United States worked in manufacturing as worked in health care. Today, employment in health care is 50 percent greater than employment in manufacturing. And these trends are likely to continue. The U.S. Bureau of Labor Statistics forecasts that 4 of the 20 fastest-growing occupations over the next 10 years will be in health care.

What explains these trends? We discuss explanations for rising health care spending in the United States in Section 7.4. For now, note that the growth of employment in health care is similar to the growth in employment in other service industries, such as fitness training and restaurants, and that the growth of employment in the health care and service industries is much faster than that in goods-producing industries, such as manufacturing. There is evidence that as people's incomes grow, their demand for health care grows faster than their demand for most other goods and services. The average age of the U.S. population is also increasing, and older people have a greater demand for health care. Finally, the Affordable Care Act has increased the demand for health care among people with low incomes in two ways: by providing subsidies to buy health insurance for people whose incomes fall below a certain level and by expanding the Medicaid system.

Whatever changes to the U.S. health care system Congress may make in the future, health care will continue to be a booming sector of the economy and an important source of new jobs in the coming decades.

Your Turn: Test your understanding by doing related problem 2.10 at the end of this chapter.

The Health Care Systems of Canada, Japan, and the United Kingdom

In many countries, such as Canada, Japan, and the United Kingdom, the government either supplies health care directly by operating hospitals and employing doctors and nurses or pays for most health care expenses, even if hospitals are not government owned and doctors are not government employees. Table 7.2 summarizes the essential aspects of the health care systems in these three countries.

Comparing Health Care Outcomes around the World

We have seen that the way health care systems are organized varies significantly across countries. Health care outcomes and the amounts countries spend on health care also differ quite a bit. In Figure 7.3, each green diamond represents a combination of health care spending per person and income per person for the 38 high-income countries that are members of the Organization for Economic Co-operation and Development (OECD). The figure shows that, typically, the higher the level of income per person in a country, the higher the level of spending per person on health care. This result is not surprising because health care is a *normal good*. We know that as income increases, so does spending on normal goods (see Chapter 3, Section 3.1). The line in the figure shows the average relationship between income per person and health care spending per person. The diamonds for most countries are fairly close to the line, but note that the diamond representing the United States is significantly above the line. Being well above the line indicates that health care spending per person in the United States is higher than in other countries, even taking into account the relatively high income levels in the United States. In Section 7.4, we will discuss explanations for the high level of health care spending in the United States.

Has the high level of health care spending in the United States resulted in better health outcomes? Are people in the United States healthier, and do they have their medical problems addressed more rapidly than do people in other countries? Table 7.3 compares several health outcomes for the countries that are members of the OECD. The table shows that the United States does relatively poorly with respect to life expectancy and infant mortality. People in the United States are significantly more likely to be obese than are people in other high-income countries, which can lead to developing diabetes and other health problems, but are less likely to smoke. People in the United States are also much more likely to die as a result of homicide.

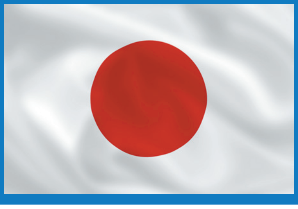
Compared with most other high-income countries, the United States rates well in the availability of medical equipment, such as CRT and MRI units, although the United States

Single-payer health care system A system, such as the one in Canada, in which the government provides health insurance to all of the country's residents.

Socialized medicine A health care system under which the government owns most of the hospitals and employs most of the doctors.

Table 7.2

Key Features of the Health Care Systems of Canada, Japan, and the United Kingdom

Feature of the Health Care System	Canada 	Japan 	United Kingdom
Type of health care system	**Single-payer health care system** The government provides *national health insurance* to all Canadian residents, with each of the 10 Canadian provinces operating its own system.	**Universal health insurance** Every resident of the country is required to enroll either in one of the many nonprofit health insurance societies or in the health insurance program operated by the federal government.	**Socialized medicine** The government owns most of the hospitals and employs most of the doctors; referred to as the National Health Service (NHS). Scotland, Wales, and Northern Ireland run their health care systems independently of England's NHS and have given them different names, although the main features of the four systems are the same.
How is government-provided health care funded?	From federal and provincial taxes	From a payroll tax on wage earners	From general government tax revenues
How do individuals pay for health care?	Individuals do not pay for doctor visits or hospital stays and do not pay for health insurance, but some people buy supplemental insurance for noncovered treatments.	Individuals and firms pay health insurance premiums, and individuals pay *copayments* for as much as 30% of charges.	Individuals do not pay for services received through the government system; 13% of the population buys private health insurance, frequently provided by employers, to cover elective surgery, such as hip replacements.
What is the relationship between doctors and hospitals and the government?	Most doctors and hospitals are private businesses but are required to accept the fees that are set by the government.	Most doctors are not government employees; there is a mixture of private and government-owned hospitals.	The government owns nearly all hospitals and employs nearly all doctors.
How much do people pay out of pocket annually for medical care not covered by insurance? (For comparison, the amount for the United States is $1,225 per person.)	$744 per person	$621 per person	$662 per person
Other features	Doctors and hospitals are reimbursed on a fee-for-service basis, as in the United States.	Health insurance does not typically cover preventive care or expenses connected with pregnancies.	The government health care system in the United Kingdom is the largest government-run health care system in the world. The system essentially trades off broader coverage for longer waiting times and performing fewer procedures, particularly nonemergency surgeries.

left: jannoon028/Shutterstock; middle: Dusan Po/Shutterstock; right: Sorapong Chaipanya/123RF

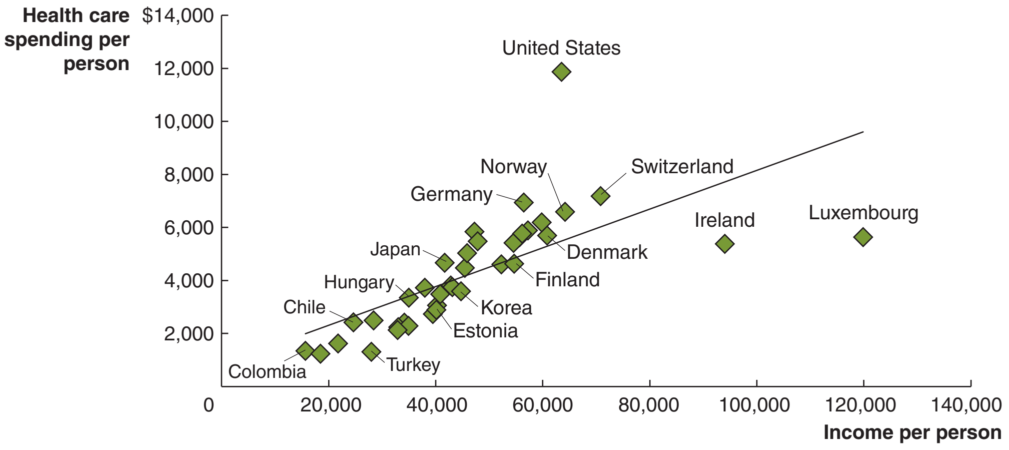


Figure 7.3 **Levels of Income per Person and Spending per Person on Health Care**

The United States is well above the line showing the average relationship between income per person and health care spending per person, which indicates that the United States spends more on health care per person than do other countries, even taking into account the relatively high levels of income in the United States.

Note: Income per person is measured as real GDP per person.

Source: Organization for Economic Co-operation and Development, "OECD Health Statistics 2022," November 30, 2022.

has relatively fewer of them than Japan. The United States also rates well in cancer treatment, with a relatively low rate of cancer deaths, particularly given that people in the United States are more likely to develop cancer, and has high survival rates for both breast cancer and colon cancer. Through January 2023, the United States had a higher-than-average death rate from Covid–19, particularly in comparison with death rates in Canada and Japan.

How Useful Are Cross-Country Comparisons of Health Outcomes?

Health economists and other researchers disagree strongly about the usefulness of cross-country comparisons of health outcomes in measuring the effectiveness of different health care systems. Here are some factors that make cross-country comparisons in health outcomes difficult:

- **Data problems.** Countries do not always collect data on diseases and other health problems in the same way. So, there are not enough consistent data available to compare health outcomes for more than a few diseases. For example, because many of the people who died from Covid–19 were elderly or had other health problems, it was sometimes difficult for doctors to determine whether a person's death was caused by Covid–19 or whether the person died from another cause while infected with the virus.
- **Problems with measuring health care delivery.** The easiest outcomes to measure are deaths because a specific event has occurred. So, measures of life expectancy, infant mortality, and mortality rates from some diseases, such as cancer, are available across countries. But much of health care involves treatment for injuries, simple surgeries, writing of pharmaceutical prescriptions, and other activities for which outcomes are difficult to measure. For example, although the United Kingdom does well in many of the measures shown in Table 7.3, patients often have long waiting times for elective surgeries, such as joint replacements, that can be arranged much more quickly in some other countries, including the United States. Waiting times in the United Kingdom for health care became particularly acute in 2023, with an article in the *Wall Street Journal* reporting that "people who suffer heart attacks or strokes wait more than 1½ hours on average for an ambulance. . . . A record 7.1 million people in England—more than one in 10 people—are stuck on waiting lists for nonemergency hospital treatment like hip replacements." Economists have difficulty measuring the cost to patients of these waiting times.

Table 7.3

Health Outcomes in High-Income Countries

Health Care Outcome	United States	Canada	Japan	United Kingdom	OECD Average
Life Expectancy					
Life expectancy at birth	77.0 years	82.7 years	84.5 years	81.5 years	79.7 years
Male life expectancy at age 65	17.0 years	19.4 years	20.1 years	18.0 years	17.8 years
Female life expectancy at age 65	19.8 years	22.1 years	24.9 years	20.6 years	21.0 years
Infant mortality (deaths per 1,000 live births)	5.4	4.5	1.8	3.6	5.5
Health Risks					
Obesity (percentage of total population with BMI $>$ 30)	41.9%	24.3%	4.6%	28.0%	—
Homicide per 100,000 population (standardized for age)	7.4	1.0	0.2	0.3	—
Percentage of adult population smoking daily	9.4%	9.4%	16.7%	14.5%	—
Physicians per 1,000 population	2.6	2.7	2.6	3.2	—
Diagnostic Equipment					
MRI units per 1,000,000 population	38.0	10.1	57.4	7.2	—
CT scanners per 1,000,000 population	42.6	14.6	115.7	9.5	—
PET scanners per 1,000,000 population	5.8	1.5	4.7	—	—
Cancer					
Cancer per 100,000 population (standardized for age)	318.0	295.7	217.1	272.9	—
Deaths from cancer per 100,000 population (standardized for age)	182.2	200.3	176.6	221.8	184.5
Deaths from colorectal cancer per 100,000 population (standardized for age)	16.4	21.9	24.4	23.4	19.7
Five-year breast cancer survival rate	90.2%	88.6%	89.4%	89.4%	84.2%
Five-year colon cancer survival rate	66.0%	67.5%	67.4%	59.7%	61.6%
Covid–19					
Deaths from Covid–19 per 1 million people as of January 2023	3,253	1,301	511	3,183	2,333

Note: Dashes indicate insufficient data.

Sources: For all data except Covid–19 death rates: Organization for Economic Co-operation and Development, "OECD Health Statistics 2022," most recent data available, typically for 2020 (2021 for life expectancy at birth). Data on obesity and cancer are standardized for age differences across countries; for Covid–19 death rates: "Cumulative Confirmed Covid–19 Deaths per Million People," ourworldindata.org; the value given for the OECD Covid–19 death rate is the authors' calculation using individual country data from ourworldindata.org, weighted by population; data on homicides are for all assaults that result in death.

- **Problems with distinguishing health care effectiveness from lifestyle choices.** Health outcomes depend partly on the effectiveness of doctors and hospitals in delivering medical services. But they also depend on the choices of individuals. For example, in the United States, the high rates of obesity and hospitalizations for diabetes—which can be a complication of obesity—may be more related to the decisions individuals make about diet and exercise than to the effectiveness of the U.S. health care system.
- **Problems with determining consumer preferences.** In most markets, we can assume that the quantities and prices we observe reflect the interactions of the preferences of consumers (demand) with the costs to firms of producing goods and services (supply). Given their incomes and preferences, consumers compare the prices

of different goods and services when making their buying decisions. The prices firms charge represent the costs of providing the good or service. In the market for health care, however, the government plays the dominant role in supplying the service in most countries other than the United States, so the cost of the service is not fully represented in its price, which in some countries is zero. Even in countries where consumers must pay for medical services, the prices they pay usually do not represent the costs of providing the services. In the United States, for instance, consumers with private health insurance typically pay only 10 to 20 percent of the price as a copayment. For these reasons, it is difficult to determine whether some countries do a better job than others in providing health care services whose cost and effectiveness are consistent with consumer preferences.

7.3 Information Problems and Externalities in the Market for Health Care

LEARNING OBJECTIVE: Define information problems and externalities and explain how they affect the market for health care.

The market for health care is significantly affected by the problem of **asymmetric information**, which occurs when one party to an economic transaction has less information than the other party. Understanding the concept of asymmetric information can help us analyze the actions of buyers and sellers of health care and health insurance and the actions of the government in the health care market. The consequences of asymmetric information may be easier to understand if we first consider its effect on the market for used automobiles, which is the market in which economists first began to carefully study this problem.

Asymmetric information A situation in which one party to an economic transaction has less information than the other party.

Adverse Selection and the Market for “Lemons”

Nobel Laureate George Akerlof of Georgetown University and the University of California, Berkeley pointed out that the seller of a used car will always have more information on the true condition of the car than will potential buyers. For example, a car that has not had its oil changed regularly can have damage that even a trained mechanic may have difficulty detecting.

If potential buyers of used cars know that they will have difficulty distinguishing good used cars from bad used cars, or “lemons,” they will take this fact into account in the prices they are willing to pay. Consider the following simple example: Suppose that half of the 2020 Honda Civics offered for sale have been well maintained and are good, reliable used cars. The other half have been poorly maintained and are lemons that will be unreliable. Suppose that potential buyers of 2020 Civics would be willing to pay $20,000 for a reliable one but only $10,000 for an unreliable one. The sellers know how well they have maintained their cars and whether they are reliable, but the buyers do not have this information and so have no way of distinguishing the reliable used cars from the unreliable ones.

In this situation, buyers will generally offer a price somewhere between the price they would be willing to pay for a good car and the price they would be willing to pay for a lemon. With a 50/50 chance of buying a good car or a lemon, buyers might offer $15,000, which is halfway between the price they would pay if they knew for certain the car was a good one and the price they would pay if they knew it was a lemon.

Unfortunately for used car buyers, a major glitch arises at this point. From the buyers’ perspective, given that they don’t know whether any particular car offered for sale is a good car or a lemon, an offer of $15,000 seems reasonable. But the sellers do know whether the cars they are offering are good cars or lemons. Therefore:

- To a seller of a good car, an offer of $15,000 is $5,000 below the true value of the car, and the seller will be reluctant to sell.
- To a seller of a lemon, an offer of $15,000 is $5,000 above the true value of the car, and the seller will be quite happy to sell.

Adverse selection The situation in which one party to a transaction takes advantage of knowing more than the other party to the transaction.

As sellers of lemons take advantage of knowing more about the cars they are selling than buyers do, buyers in the used car market will fall victim to **adverse selection**: Most used cars offered for sale will be lemons. In other words, because of asymmetric information, the market has selected adversely the cars that will be offered for sale. Notice as well that the problem of adverse selection reduces the total quantity of used cars bought and sold in the market because few good cars are offered for sale.

Asymmetric Information in the Market for Health Insurance

Asymmetric information problems are particularly severe in the markets for all types of insurance, including health insurance. To understand this point, consider how insurance works. Insurance companies provide the service of *risk pooling* when they sell policies to households. For example, if you own a $250,000 house but do not have a fire insurance policy, a fire that destroys your house can be a financial catastrophe. But an insurance company can pool the financial risk of your house burning down by selling fire insurance policies to you and thousands of other homeowners. Homeowners are willing to accept the certain cost represented by the premium they pay for insurance in return for eliminating the uncertain—but potentially very large—cost should their house burn down.

Notice that for the insurance company to cover all of its costs, the total amount it receives in premiums must be greater than the amount it pays out in claims to policyholders. To survive, insurance companies have to predict accurately the amount they are likely to pay out to policyholders. For instance:

- If an insurance company predicts that the houses of only 2 percent of policyholders will burn down during a year when 5 percent of houses actually burn down, the company will suffer losses.
- If the company predicts that 8 percent of houses will burn down when only 5 percent actually do, the company will have charged premiums that are too high. A company that charges premiums that are too high will lose customers to other companies and may eventually be driven out of business.

Adverse Selection in the Market for Health Insurance Health insurance companies face a key obstacle to accurately predicting the number of claims policyholders will make: Buyers of health insurance policies always know more about the state of their health—and, therefore, how likely they are to submit medical bills for payment—than do the insurance companies. In other words, insurance companies face an adverse selection problem because sick people are more likely to want health insurance than are healthy people. If insurance companies have trouble determining who is healthy and who is sick, they are likely to sell policies to more sick people than they had expected, with the result that the premiums they charge will be too low to cover their costs.

An insurance company facing this problem might try to increase the premiums it charges, but the increase could make the adverse selection problem worse. If premiums rise, then younger, healthier people who rarely visit the doctor may drop their insurance. The higher premiums make the adverse selection problem worse for the insurance company because it will have fewer healthy policyholders than it had before the premium increase. The situation is similar to that facing a used car buyer who knows that adverse selection is a problem in the used car market and decides to compensate for it by lowering the price he is willing to pay for a car. The lower price will reduce the number of sellers of good cars willing to sell to him, making his adverse selection problem worse.

One way to deal with the problem of adverse selection is for the government to require every person to buy insurance. Doing so would increase the ability of insurance companies to engage in risk pooling. Most states require all drivers to buy automobile insurance so that both high-risk and low-risk drivers will carry insurance. The Affordable Care Act (ACA), passed in 2010, originally included a provision called the *individual mandate*, which required residents of the United States to buy health insurance or pay a fine. In December 2017, Congress repealed the individual mandate.

Moral Hazard in the Market for Health Insurance Insurance markets are subject to a second consequence of asymmetric information: **Moral hazard** refers to actions people take after they have entered into a transaction that make the other party to the transaction worse off. Moral hazard in insurance markets occurs when people change their behavior after becoming insured. For example, once a firm has taken out a fire insurance policy on a warehouse, its managers might be reluctant to install an expensive sprinkler system. Similarly, someone with health insurance may visit the doctor for treatment of a cold or other minor illness, which he would not do if he lacked insurance. Or someone with health insurance might engage in risky activities, such as riding a motorcycle, which she would not do if she lacked insurance.

Moral hazard Actions people take after they have entered into a transaction that make the other party to the transaction worse off.

One way to think about the basic moral hazard problem with health insurance is to note that normally there are two parties to an economic transaction: the buyer and the seller. The insurance company becomes a third party to the purchase of medical services because the insurance company, rather than the patient, pays for some or all of the service. For this reason, economists refer to traditional health insurance as a *third-party payer* system. Because of this system, consumers of health care do not pay a price that reflects the full cost of providing the service. This lower price leads consumers to use more health care than they otherwise would.

Don't Let This Happen to You

Don't Confuse Adverse Selection with Moral Hazard

The two key consequences of asymmetric information are adverse selection and moral hazard. It is easy to mix up these concepts. One way to keep the concepts straight is to remember that:

- Adverse selection refers to what happens at the time of entering into a transaction. An example would be an insurance company selling a life insurance policy to a terminally ill person because the company lacks full information on the person's health.
- Moral hazard refers to what happens after entering into a transaction, such as a nonsmoker buying a life insurance policy and then starting to smoke four packs of cigarettes a day.

It may help to remember that *a* comes before *m* alphabetically, just as *a*dverse selection comes before *m*oral hazard.

Your Turn: Test your understanding by doing related problems 3.9 and 3.10 at the end of this chapter.

Third-party payer health insurance can also lead to another consequence of moral hazard, known as the *principal–agent problem*, because some doctors may be led to take actions that are not necessarily in the best interests of their patients, such as increasing their incomes by prescribing unnecessary tests or other treatments for which the doctors receive payment. The **principal–agent problem** results from agents—in this case, doctors—pursuing their own interests rather than the interests of the principals—in this case, patients—who hired them. If patients had to pay the full price of lab tests, MRI scans, and other procedures, they would be more likely to question whether the procedures were really necessary. Because health insurance pays most of the bill for these procedures, patients are more likely to accept them. Note that the fee-for-service aspect of most health insurance in the United States can make the principal–agent problem worse because doctors and hospitals are paid for each service performed, regardless of whether the service was necessary or effective.

Principal–agent problem A problem caused by an agent pursuing the agent's own interests rather than the interests of the principal who hired the agent.

The number of medical procedures performed in the United States has been continually increasing. Many doctors argue that this increase is not the result of third-party payer health insurance. Instead, the increase is due to the improved effectiveness of the procedures in diagnosing illness and the tendency of some doctors to practice "defensive medicine" because they fear that if they fail to correctly diagnose an illness, a patient may file a *malpractice lawsuit* against them.

How Insurance Companies Deal with Adverse Selection and Moral Hazard Insurance companies can take steps to reduce adverse selection and moral hazard problems. For example, most insurance companies include deductible and coinsurance (or copayment) provisions in their policies. A deductible requires the policyholder to pay a certain dollar amount before the insurance begins paying claims. With coinsurance, the insurance company pays only a percentage of any claim. Suppose you have a health insurance policy with a $200 deductible and 20 percent coinsurance, and you receive a medical bill for $1,000. You must pay the first $200 of the bill and 20 percent of the remaining $800. Deductibles and coinsurance make the policies less attractive to people who intend to file many claims, thereby reducing the adverse selection problem. Deductibles and coinsurance also provide policyholders with an incentive to avoid filing claims, thereby reducing the moral hazard problem. Deductibles have been increasing in many employer-provided health insurance plans. According to a survey by the Kaiser Family Foundation, in 2022, 88 percent of employer plans had deductibles, with the deductibles averaging $1,763. In 2009, only 7 percent of workers were enrolled in plans with deductibles of $2,000 per year or more, but by 2022, 32 percent of all workers and 49 percent of workers at firms with fewer than 200 workers were enrolled in such plans. Notice, though, that deductibles and coinsurance reduce, but do not eliminate, adverse selection and moral hazard. People who anticipate having large medical bills will still have a greater incentive than healthy people to buy insurance, and people with health insurance are still more likely to visit the doctor even for a minor illness than are people without health insurance.

Prior to the passage of the ACA in 2010, to reduce the problem of adverse selection, insurance companies typically limited coverage of *preexisting conditions,* which are medical problems, such as heart disease or cancer, that the buyer already has before purchasing insurance. Critics argue that by excluding coverage of preexisting conditions, insurance companies were forcing people with serious illnesses to pay the entire amount of what might be very large medical bills or to go without medical care. Some people with chronic or terminal illnesses found it impossible to buy an individual health insurance policy. The insurance companies argued that if they did not exclude coverage of preexisting conditions, they might have been unable to offer any health insurance policies or might have been forced to charge premiums that were so high as to cause relatively healthy people to not renew their policies, which would have made adverse selection problems worse. To some extent, the debate over coverage of preexisting conditions is a normative one. Ordinarily, in a market system, people who cannot afford a good or service must do without it. However, many people do not want others to be without health insurance because they cannot afford it. Congress included significant restrictions on the ability of insurance companies to limit coverage of preexisting conditions when it passed the ACA.

Externalities in the Market for Health Care

For most goods and services, we assume that the consumer receives all the benefits from consuming the good and that the firm producing the good bears all of the costs of production. Some goods or services, though, involve an *externality*, which is a benefit or cost that affects someone who is not directly involved in the production or consumption of a good or service. For example, if a utility burns coal to produce electricity, it will create air pollution, which causes a *negative externality* because, for instance, people with asthma or other breathing problems may bear a cost even though they were not involved in buying or selling the electricity that caused the pollution. College education may result in a *positive externality* because college-educated people are less likely to commit crimes, more likely to make the people they work with more productive, and, by being better-informed voters, more likely to support economically efficient government policies. So, although you receive most of the benefits of your college education, other people also receive some of the benefits.

Externalities interfere with the economic efficiency of a market equilibrium. A competitive market achieves economic efficiency by maximizing the sum of consumer surplus and producer surplus (see Chapter 4, Section 4.1). But when there is a negative externality in production, as with air pollution, the market will produce more than the efficient quantity. When there is a positive externality in consumption, as with college educations, the market will produce less than the efficient quantity. (A more complete discussion of externalities appears in Chapter 5.)

Many economists believe that several aspects of health care involve externalities. For example, people vaccinated against a communicable disease like measles not only protect themselves but also reduce the likelihood that people who have not been vaccinated will contract the disease. The positive externality from vaccinations causes a difference between the *private benefit* from being vaccinated and the *social benefit*:

- The private benefit is the benefit you receive as a consumer of a good or service.
- The social benefit is the total benefit from consuming a good or service, and it is equal to the private benefit plus any external benefit, such as the benefit to others from a reduced chance of contracting a disease for which you have been vaccinated.

Because of the positive externality, the social benefit of vaccinations is greater than the private benefit.

Figure 7.4 shows the market for vaccinations. If people receiving vaccinations could capture all the benefits, the demand curve would be D_2, which represents the marginal social benefit. The actual demand curve is D_1, however, which represents only the marginal private benefit received by people getting vaccinations. The efficient equilibrium would occur at price $P_{\text{Efficient}}$ and quantity $Q_{\text{Efficient}}$. At this equilibrium, economic surplus is maximized. The market equilibrium, at price P_{Market} and quantity Q_{Market}, will not be efficient because the demand curve is above the supply curve for production of vaccinations between Q_{Market} and $Q_{\text{Efficient}}$. That is, the marginal benefit—including the external benefit—for producing these vaccinations is greater than the marginal cost. As a result, there is a deadweight loss equal to the area of the yellow triangle. Because of the positive externality, economic efficiency would be improved if more people were vaccinated.

Figure 7.4 assumes that the market for vaccinations is like the market for goods such as hamburgers, with consumers paying the full price of the vaccinations. In practice, people with health insurance pay a reduced price for vaccinations, and the government often provides further subsidies to the firms that produce vaccines. For example, in May 2020, the Trump administration, under a program called *Operation Warp Speed*, spent more than \$10 billion subsidizing the development and production of Covid–19 vaccines by pharmaceutical firms. The federal government purchased the doses from the pharmaceutical firms and distributed them to the state governments at no cost to the states. Injections were free to patients at most vaccination sites. Such government subsidies are intended to offset the effect of a positive externality from vaccination that would otherwise result in the market producing an inefficiently small quantity of vaccines.

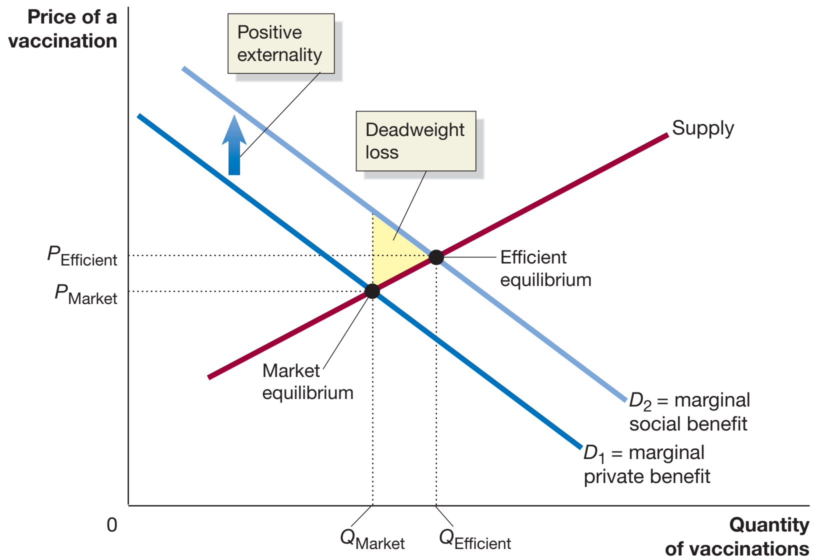


Figure 7.4

The Effect of a Positive Externality on the Market for Vaccinations

People who do not get vaccinated benefit from other people being vaccinated. As a result, the marginal social benefit from vaccinations is greater than the marginal private benefit to people being vaccinated. Because only the marginal private benefit is represented in the market demand curve D_1, the quantity of vaccinations produced, Q_{Market}, is too low. If the market demand curve were D_2 instead of D_1, the level of vaccinations would be $Q_{\text{Efficient}}$, which is the efficient level. At the market equilibrium of Q_{Market}, there is a deadweight loss equal to the area of the yellow triangle.

Externalities are important in health care markets, but economists and policymakers continue to debate the extent to which they require significant government involvement in health care.

Should the Government Run the Health Care System?

As we noted in the chapter opener, some members of Congress have proposed a program called "Medicare for All" that would establish a system under which the federal government would pay for all medical care, eliminating private health insurance plans. In Section 7.4, we discuss this proposal along with a proposal from some policymakers, including President Biden, that the federal government directly offer health insurance to people younger than 65 as a "public option." First, we consider some general factors relevant to assessing the role the federal government should play in health care.

Is Health Care a Public Good? Goods that are usually supplied by the government, rather than by private firms, are called *public goods*. Economists categorize goods on the basis of whether they are *rival* and *excludable*. Rivalry occurs when one person consuming a unit of a good means no one else can consume it. If you consume a salad from Panera Bread, for example, no one else can consume it. Excludability means that anyone who does not pay for a good cannot consume it. If you don't pay for a salad, for example, Panera can exclude you from consuming it. A *public good* is both nonrival and nonexcludable. The classic example of a public good is national defense. Your consuming national defense does not interfere with your neighbor consuming it, so consumption is nonrival. You also cannot be excluded from consuming it, whether you pay for it or not. No private firm would be willing to supply national defense because everyone can consume national defense without paying for it.

Is health care a public good that government should supply—or, at least, pay for? Is it a private good, like furniture, clothing, or smartphones, that private firms should supply and consumers should pay for without government aid? Should private firms supply most health care, subject to some government regulation? Economists differ in their answers to these questions because the delivery of health care involves a number of complex issues, but we can consider briefly some of the most important points. Because public goods must be both nonrival and nonexcludable, health care does not qualify as a public good under the usual definition. More than one person cannot simultaneously "consume" the same surgical operation performed by a particular doctor in a particular hospital. And someone who will not pay for an operation can be excluded from consuming it. (Most states require hospitals to treat patients who have incomes below a particular level, and many doctors will treat people with low incomes at a reduced price. But health care does not fit the definition of a public good because there is nothing about health care that keeps people who do not pay for it from being excluded from consuming it.)

Do Externalities in Health Care Justify More Government Intervention? Aspects of the delivery of health care have convinced some economists that government intervention is justified. As we've seen, consuming certain types of health care generates positive externalities. For example, the market may supply an inefficiently small quantity of vaccinations unless vaccinations receive a government subsidy.

Do Information Problems with Health Care Justify More Government Intervention? Information problems are important in the market for private health insurance. Consumers who buy health insurance often know much more about the state of their health than do the companies selling health insurance. This information problem may increase costs for insurance companies when the pool of people being insured is small, making insurance companies less willing to offer health insurance to people the companies suspect may file too many claims. Economists debate the significance of information problems in health care markets and whether government intervention is required to reduce them.

Or Should There Be Greater Reliance on Market-Based Policies? Many economists believe that using market-based policies is the best approach to improving the health care system. As we saw in Table 7.3, the United States has a mixed record on health outcomes. The United States is, however, a world leader in innovation in medical technology and prescription drugs, as was again demonstrated by U.S.-based pharmaceutical firms rapidly developing and mass producing Covid–19 vaccines. The market-oriented approach to reforming health care starts with the goal of improving health care outcomes while preserving incentives for U.S. firms to continue with innovations in medical screening equipment, surgical procedures, and prescription drugs. Presently, markets are delivering inaccurate signals to consumers because when buying health care, unlike when buying most other goods and services, consumers pay a price well below the true cost of providing the service. Under current tax laws, the cost of the health insurance that a company provides to its employees isn't included in the employees' taxable income. This tax benefit encourages employees to want generous coverage that reduces the economic incentive to control health care costs. As we will discuss in Section 7.4, market-based approaches to health care reform attempt to address these issues.

It remains an open question whether the U.S. health care system will continue to move toward greater government intervention, such as Medicare for All, which is the approach adopted in most other countries, or whether market-based reforms will be implemented. Because health care is so important to consumers and because health care is an increasingly large part of the U.S. economy, the role of the government in the health care system is likely to be the subject of intense debate for some time to come.

7.4 The Debate over Health Care Policy in the United States

LEARNING OBJECTIVE: Explain the major issues involved in the debate over health care policy in the United States.

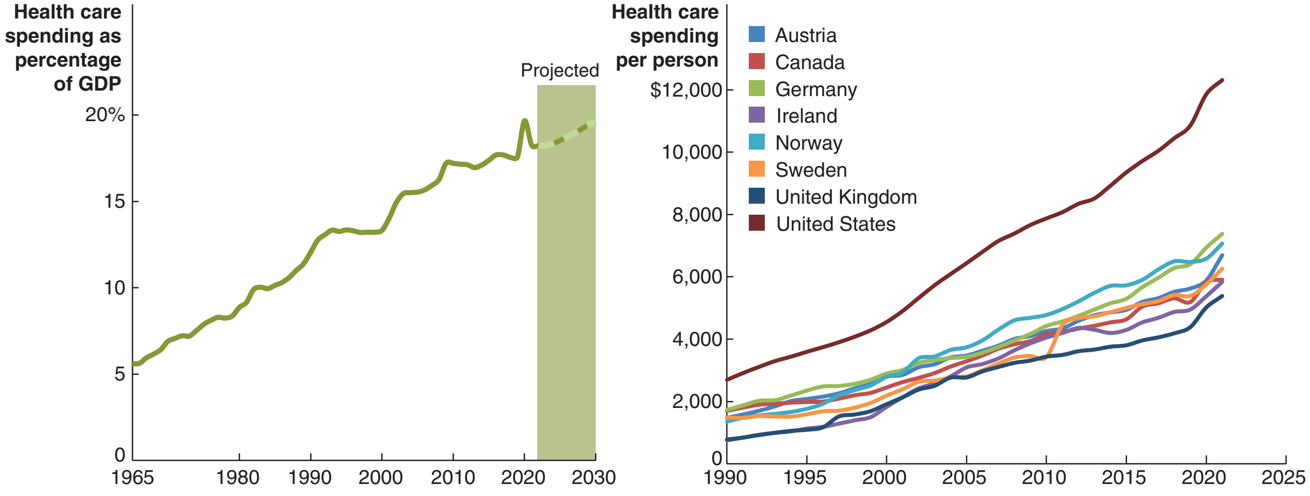
In 2010, President Barack Obama proposed and Congress enacted the Affordable Care Act (ACA). The act was controversial, and since its passage, economists have debated its effects on health care and the economy. As background to discussing the debate over the ACA and recently proposed changes to the health care system—including the proposal to have the government directly provide health insurance to anyone who would like it—we explore the issue of the rising cost of health care, which plays an important role in the health care debate.

The Rising Cost of Health Care

Figure 7.5 illustrates a key fact underlying the debate over health care policy in the United States: Health care's share of gross domestic product (GDP), which is the total value of output in the economy, is increasing. Panel (a) shows that spending on health care was less than 6 percent of GDP in 1965 but had risen to 18.3 percent in 2022, and it is projected to continue rising in future years. In other words, an increasing percentage of total production in the United States is being devoted to health care. (Note in the figure the temporary surge in spending on health care due to the Covid–19 pandemic.) Panel (b) shows increases in health care spending per person in the United States and seven other high-income countries. Spending on health care has grown faster in the United States than in other countries. Today, the United States spends nearly twice as much per person on health care as does the typical high-income country.

Does it matter that spending on health care is an increasing share of total spending and output in the U.S. economy? The shares of different products in total spending change frequently. For instance, in the United States, the shares of spending on smartphones and streaming movies were much greater in 2022 than in 2010. Spending on food as a share of total spending has been declining for decades. Economists interpret these changes as reflecting in part consumers' preferences: Consumers choose to spend relatively more of their incomes on smartphones and relatively less on food. As we have seen, though, most people pay for health care by relying on third-party payers, such as employer-provided health insurance or government-provided Medicare or Medicaid. Out-of-pocket spending—spending on health care that consumers pay out of their own incomes rather than through health insurance—has been declining.

Figure 7.6 shows that out-of-pocket spending on health care as a percentage of all spending on health care has fallen steadily since 1960. In 1960, 47 percent of all health



(a) Spending on health care in the United States as a percentage of GDP, 1965–2030

(b) Health care spending per person, 1990-2021

Figure 7.5 **The Trend in U.S. Health Care Spending**

Panel (a) shows that health care spending has been a rising percentage of GDP in the United States. Health care spending rose from less than 6 percent of GDP in 1965 to 18.3 percent in 2022, and it is projected to rise further in future years. (The projected increases are shown in the shaded area.)

Panel (b) shows that health care spending per person has been growing faster in the United States than in other high-income countries.

Sources: For panel (a): U.S. Department of Health and Human Services, Centers for Medicare & Medicaid Services; for panel (b): Organization for Economic Co-operation and Development, "OECD Health Statistics 2022," November 30, 2022.

care spending was out of pocket, while today only about 10 percent is. As a result, in recent years, consumers of health care have been directly paying for only a small fraction of the true cost of providing health care, with third-party payers picking up the remainder. Consumers would be likely to buy less health care if they had to pay its full cost.

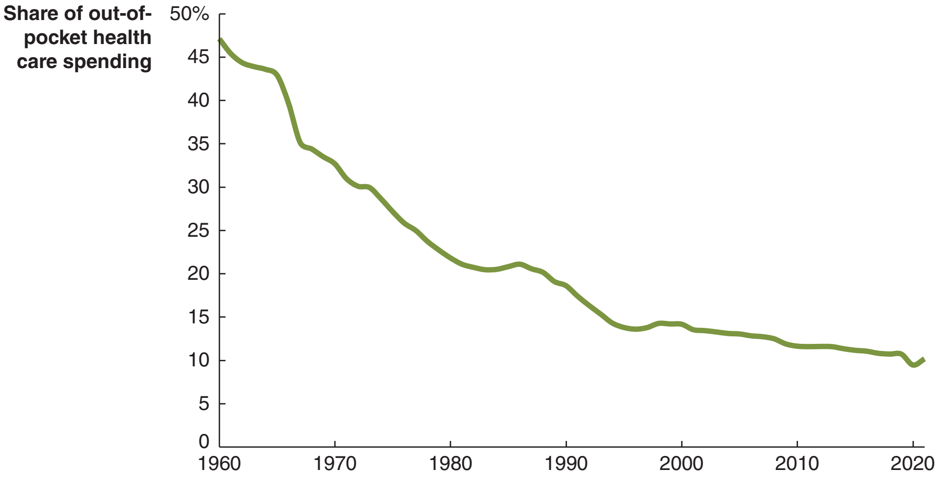
Because the federal and state governments in the United States pay for just over half of health care spending through Medicare, Medicaid, and other programs, increases in health care spending can cause problems for government budgets. The Medicare and Medicaid programs began in 1965. By 2019, spending on these programs, combined with spending on the Children's Health Insurance Program (CHIP), which provides health coverage to children not eligible for Medicaid, had grown to 5.4 percent of GDP. That percentage is expected to double over the next 40 years unless health care costs grow at a slower rate than expected. Congress and the past several presidents have been struggling to find ways to pay for the projected increases in Medicare and Medicaid without severely cutting other federal spending or sharply raising taxes.

Figure 7.6

The Declining Share of U.S. Out-of-Pocket Health Care Spending

Out-of-pocket spending on health care has declined sharply as a fraction of all health care spending, while the fraction of spending accounted for by third-party payers, such as firms or the government, has increased.

Source: U.S. Department of Health and Human Services, Centers for Medicare & Medicaid Services.

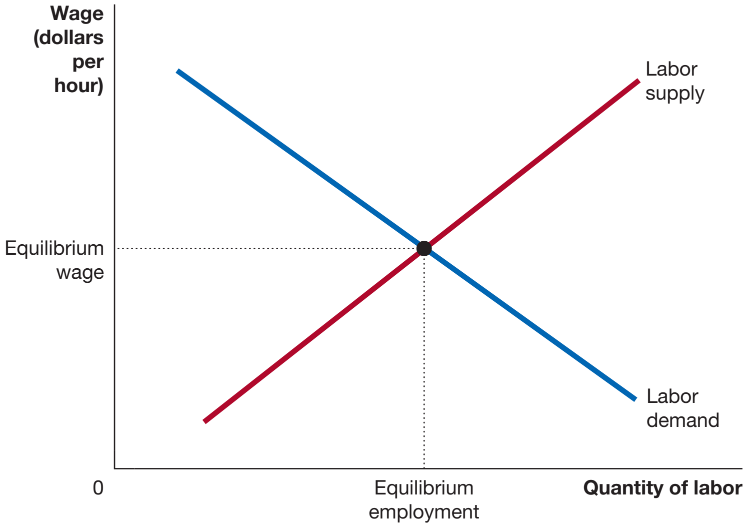


Apply the Concept

Are U.S. Firms Disadvantaged by Paying for Their Employees' Health Insurance?

Some members of Congress and some business leaders argue that the high cost of health care in the United States puts U.S. firms at a disadvantage in competition with foreign firms. In many countries, firms do not purchase health insurance for their workers, as most large firms do in the United States. Do foreign firms in fact have an advantage over U.S. firms because of high U.S. health care costs? We can analyze this assertion using the model of the demand and supply for labor.

The following figure illustrates the market for labor in a particular industry (for example, automobiles). The demand curve is downward sloping because the lower the wage, the larger the quantity of workers firms will demand. The supply curve is upward sloping because as the wage rises, more workers will want to work in this industry. (A more complete discussion of the labor market appears in Chapter 16.)



Equilibrium in this labor market occurs where the quantity of labor demanded equals the quantity of labor supplied. On the vertical axis, we measure the wage, so the graph shows the determination of the equilibrium wage. When choosing among jobs, however, workers don't just consider the wages firms offer; they also take into account *fringe benefits*, such as employer contributions to retirement accounts or employer-provided health insurance. It would therefore be more accurate to describe the intersection of the labor demand and labor supply curves as determining the *equilibrium compensation* rather than the equilibrium wage.

Suppose the United States moved to a health care system like Canada's, in which the government uses tax revenue to pay for most health care costs. If labor markets determine equilibrium compensation, what would happen if firms no longer paid for their employees' health insurance? The Congressional Budget Office (CBO) undertakes studies of policy issues for Congress. In an overview of proposals for reforming health insurance in the United States, the CBO addressed this question:

> Some observers have asserted that domestic producers that provide health insurance to their workers face higher costs for compensation than competitors based in countries where insurance is not employment based and that fundamental changes to the health insurance system could reduce or eliminate that disadvantage. However, such a cost reduction is unlikely to occur. . . . The equilibrium level of overall compensation in the economy is determined by the supply of and the demand for labor. Fringe benefits (such as health insurance) are just part of that compensation. Consequently, the costs of fringe benefits are borne by workers largely in the form of lower cash wages

> than they would receive if no such benefits were provided by their employer. Replacing employment-based health care with a government-run system could reduce employers' payments for their workers' insurance, but the amount that they would have to pay in overall compensation would remain essentially unchanged.

To give an example, suppose a firm were paying its workers $50,000 in wages and paying $10,000 per worker for health insurance, thereby providing total compensation of $60,000. If the government began paying all health care expenses, it might appear that the firm's labor costs would drop by $10,000 per worker. But if the firm offered its employees only $50,000 in wages as their total compensation, many would leave to work for other firms. The firm would have to pay its employees an additional $10,000 in wages so that the total compensation it offered would be at the equilibrium level of $60,000 for the industry. In other words, basic demand and supply analysis indicates that having firms rather than the government provide health insurance to workers changes the *composition* of the compensation that firms pay workers but does not change the *amount* of compensation that firms pay.

(Note that in this discussion, for the sake of simplicity, we are ignoring the point made earlier that the wages workers receive are considered part of their income for federal income tax purposes, but the value of their fringe benefits is ordinarily not considered part of workers' taxable incomes. As a result, many workers would prefer to receive $10,000 in nontaxable health insurance than $10,000 in taxable wages. Our basic conclusion that firms are not disadvantaged by providing their employees with health insurance would not be significantly changed if we included this complication in the analysis.)

Your Turn: Test your understanding by doing related problem 4.11 at the end of this chapter.

Explaining Increases in Health Care Spending

In this section, we briefly discuss some explanations for why health care's share of the U.S. economy has been continually increasing. We start by reviewing explanations that policymakers and journalists sometimes offer but that are unlikely to account for most of the increases in health care costs.

Factors That Do *Not* Explain Sustained Increases in Health Care Spending The two panels of Figure 7.5 show that spending on health care has been growing faster than the economy as a whole for at least the past several decades. To explain the rapid growth of health care spending, it is necessary to identify factors that have more than a one-time effect. For example:

- **Administrative costs.** Because the U.S. health care system relies on many independent hospitals, medical practices, and insurance companies, some observers argue that it generates more paperwork, duplication, and waste than systems in other countries. Even if this observation is correct, it cannot account for health care's rising share of GDP unless paperwork and waste are *increasing* year after year, which seems unlikely.
- **Prescription drug prices.** Prescription drugs have higher prices in the United States than in most other high-income countries. But prescription drugs account for only 10 percent of total health care spending. Large increases in the prices of some drugs have been highlighted in news reports and can be a significant burden on some patients, but overall, spending on prescription drugs has been increasing more slowly than other health care costs. In 2022, the Biden administration proposed and Congress passed legislation to reduce prescription drug prices for people on Medicare. The cost of insulin was capped at $35 per month, and beginning in 2025, Medicare will be allowed to negotiate with pharmaceutical firms on the prices of 10 prescription drugs. Some economists and policymakers were concerned that controlling the price of prescription drugs might reduce the incentive pharmaceutical firms have to spend on research and development for new prescription drugs.

- **Lawsuits.** Unlike in most other countries, it is relatively easy in the United States for patients who have been injured by medical errors to sue doctors and hospitals for damages. The Congressional Budget Office (CBO) estimates, though, that the payments to settle malpractice lawsuits plus the premiums doctors pay for malpractice insurance amount to less than 1 percent of health care costs. Other economists believe that the CBO estimate is too low and that the costs of malpractice lawsuits, including the costs of unnecessary tests and procedures doctors order to avoid being sued, are as much as 7 percent of total health care costs. Still, these costs have not been significantly increasing over time.
- **Uninsured patients.** Somewhere between 1 and 4 percent of health care costs were historically due to uninsured patients going to hospital emergency rooms for treatments that could have been provided less expensively in doctors' offices. However, these costs did not increase rapidly enough to account for much of the increase in health care costs as a percentage of GDP. In addition, the implementation of the ACA led to a decrease in the number of uninsured people, and these costs have declined.

In the next sections, we discuss three factors that many economists believe help explain the sustained increases in health care spending.

"Cost Disease" in the Health Care Sector Some economists argue that health care suffers from a problem often encountered in service industries. In the sectors of the economy that produce goods, such as the manufacturing sector, *productivity*, or the amount of output each worker can produce in a given period, increases steadily. Increases in productivity occur over time because:

1. Firms provide workers with more machinery and equipment, including computers, industrial robots, and software.
2. Technological progress results in improvements in both machinery and equipment and other parts of the production process.

As workers produce more goods, firms are able to pay them higher wages. By contrast, in service industries, increasing output per worker is more difficult. In medicine, MRI units, CT scanners, and other medical technology have improved diagnosis and treatment, but most medicine still requires a face-to-face meeting between a doctor, a physician assistant, or a medical technologist and a patient. As wages rise in industries in which productivity is increasing rapidly, service industries must match these wage increases or lose workers. Because increases in wages are not offset by increases in productivity in service industries, the cost to firms of supplying services increases.

The late William Baumol of New York University labeled the tendency for low productivity growth in service industries to lead to higher costs in those industries as "the cost disease of the service sector." Health care suffers from this cost disease because growth in labor productivity in this sector has been less than half as fast as labor productivity growth in the economy as a whole. This slow growth in productivity can help explain why the cost of health care has been rising rapidly, thereby increasing health care's share of total spending and output.

The Aging of the Population and Advances in Medical Technology

As people age, they increase their spending on health care. Firms continue to develop new prescription drugs and medical equipment that often cost more than the drugs and equipment they replace. The aging of the U.S. population and the introduction of higher-cost drugs and medical equipment interact to drive up spending on the federal government's Medicare program and on health care in general. People over age 65 disproportionately use many newly introduced drugs and diagnostic tools. Partly as a result, health care spending on people over age 65 is six times greater than spending on people aged 18 to 24 and four times greater than on people aged 25 to 44. In 2022, 64.5 million people were enrolled in Medicare, and that number is expected to grow to 78 million by 2030. Enrollment in Medicaid reached 83.5 million in the same year. As we have seen, even in the absence of the development of new drugs and other medical technology, low rates of productivity in the health care sector could be expected to drive up costs. The CBO estimates that federal government spending on Medicare, Medicaid, the Children's Health Insurance Program (CHIP), and subsidies to the health insurance marketplaces established under the ACA will increase from 5.7 percent of GDP in 2022 to 8.8 percent of GDP in 2052. The CBO estimates that more of the increase in federal spending on Medicare and Medicaid benefits will be due to increases in the cost of providing health care rather than to the aging of the population. An aging population and increases in the cost of providing health care are key reasons health care spending is an increasing percentage of GDP. As one component of GDP—in this case federal government spending on health care—increases, other components of GDP, such as consumer spending on non-medical goods and services, federal spending on national defense and maintaining the national parks, or business spending on developing new products, have to decrease.

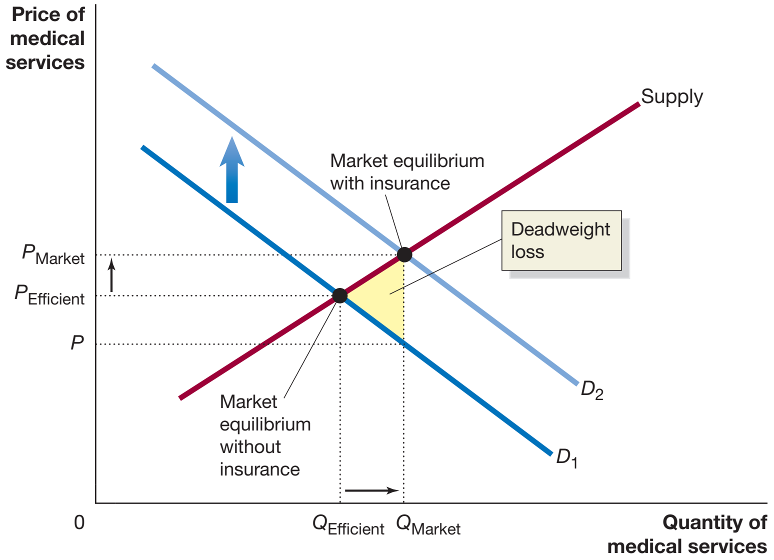
Distorted Economic Incentives As we noted earlier, some part of the increase in health care spending over the years has resulted from consumers choosing to allocate more of their incomes to health care as their incomes rise. But as we have also seen, consumers usually pay less than the true cost of medical treatment because a third party—typically an insurance company or the government—often pays most of the bill. For example, once they have satisfied their insurance plan's deductible, consumers who have health insurance provided by their employers usually pay only a small amount—perhaps $20—for a visit to a doctor's office, when the true cost of the visit might be $80 or $90. As a result, consumers demand a larger quantity of health care services than they would if they paid a price that better represented the cost of providing the services.

Figure 7.7 illustrates this situation. If consumers paid the full price of medical services, their demand would be D_1. The marginal benefit to consumers from medical services would equal the marginal cost of producing the services, and the equilibrium quantity would be at the efficient level $Q_{\text{Efficient}}$. However, because consumers pay only a fraction of the true cost of medical services, their demand increases to D_2. In this equilibrium, the quantity of medical services produced increases to Q_{Market}, which is beyond the efficient level. The marginal cost of producing these additional units is greater than the marginal benefit consumers receive from them. As a result, there is a deadweight loss equal to the area of the yellow triangle. Doctors and other suppliers of medical services receive a price, P_{Market}, that is well above the price, P, paid by consumers. Note that the effect of a third-party payer is common to nearly all health care systems, whether the government provides health care directly, as is done in the United Kingdom, or whether many people have private health insurance, as in the United States.

Figure 7.7

The Effect of the Third-Party Payer System on the Demand for Medical Services

If consumers paid the full price of medical services, their demand would be D_1, and the equilibrium quantity would be at the efficient level $Q_{\text{Efficient}}$. Because consumers pay only a fraction of the true cost of medical services, their demand is D_2, and the equilibrium quantity of medical services produced increases to Q_{Market}, which is beyond the efficient level. There is a deadweight loss equal to the yellow triangle. Doctors and other suppliers of medical services receive a price, P_{Market}, that is well above the price, P, paid by consumers.



Health Insurance Differs from Other Types of Insurance Health insurance is different from other types of insurance in important ways. As we discussed earlier, the basic idea of insurance is that the financial risk of an unpredictable, high-cost event—a house fire or a serious car accident—is pooled among the many consumers who buy insurance. When people insure their houses or their cars, the insurance doesn't pay for routine expenses, such as painting their houses or changing the oil in their cars. In contrast, health insurance, in addition to covering unplanned major expenses such as an unexpected serious illness that requires hospitalization, also typically covers many planned expenses, such as routine health checkups and contraceptives, and other low-cost events, such as treatment for minor illnesses. In fact, the early programs run by Blue Cross and Blue Shield in the 1930s and 1940s called the service they were offering *prepaid medical care* rather than insurance. In other words, they were, in effect, offering people participating in their plans the opportunity to pay premiums in order to accumulate funds that they might need in the future to pay doctors or hospitals. Participants in current health insurance plans often fail to realize the true cost of doctor visits and other routine expenses. In that way, health insurance encourages overuse of health care services.

We discuss the role of economic incentives in health care further in the next section.

The Continuing Debate over Health Care Policy

As we have seen, the United States has been unusual among high-income countries in relying on private health insurance, usually purchased through employers or the health insurance marketplaces, to provide health care coverage to the majority of the population. Most other high-income countries either provide health care directly or provide health insurance to all residents without directly employing doctors or owning hospitals. There have been several attempts to reorganize the U.S. health care system to make it more like the systems in other countries. In 1945, President Harry Truman proposed a plan for *national health insurance,* under which anyone could purchase health insurance from the federal government. The health insurance would have covered treatment received from doctors and hospitals that agreed to enroll in the system. Congress declined to enact the plan. In 1993, President Bill Clinton proposed a health care plan intended to provide universal insurance coverage. While somewhat complex, the plan was based on requiring most businesses to provide health insurance to their employees and new government-sponsored health alliances that would ensure coverage for anyone who otherwise would not have health insurance. After a prolonged political debate, Congress chose not to enact President Clinton's plan.

The Affordable Care Act In 2009, President Barack Obama proposed health care legislation that—after much debate and significant changes—was signed into law as the Affordable Care Act (ACA) in March 2010. The act was long and complex, at more than 20,000 pages, and touched nearly every aspect of health care in the United States. Here is a summary of only the main provisions of the act:

- **Individual mandate.** The act required that, with limited exceptions, every resident of the United States had to have health insurance that met certain basic requirements. Individuals who did not acquire health insurance were subject to a fine. Congress repealed the individual mandate in 2017.
- **State health insurance marketplaces.** Each state was required to establish a marketplace called an Affordable Insurance Exchange. The state could choose to run this exchange itself or rely on the federal government to run it. Private insurance companies compete by offering policies on the marketplaces to individuals and small businesses. Individuals with low incomes and small businesses with 25 or fewer employees are eligible for tax credits to offset the costs of buying health insurance. The purpose of the marketplaces is to allow greater risk pooling and lower administrative costs than existed in the market for health insurance policies sold to individuals or small businesses. Greater risk pooling and lower administrative costs make it possible for individuals and small businesses to buy policies with lower premiums than were formerly available. Although millions of people have purchased health insurance policies through the marketplaces, some insurance companies

have pulled out of the marketplaces in some states. These companies found that adverse selection problems—with the proportion of older, sicker patients turning out to be higher than expected—and higher administrative costs resulted in their suffering losses on the policies they offered in the marketplaces.

- **Employer mandate.** Every firm with more than 200 full-time employees must offer health insurance to its employees and must automatically enroll them in the plan. Firms with 50 or more full-time employees must offer health insurance that meets certain requirements or pay a fee to the federal government for every employee who receives a tax credit from the federal government for obtaining health insurance through a health insurance marketplace.
- **Regulation of health insurance.** Insurance companies are required to participate in a high-risk pool that will insure individuals with preexisting medical conditions who have been unable to buy health insurance for at least six months. All individual and group policies must provide coverage for dependent children up to age 26. Lifetime dollar maximums on coverage are prohibited.
- **Changes to Medicaid.** Eligibility for Medicaid was originally expanded to persons with incomes up to 138 percent of the federal poverty line, although a 2012 Supreme Court decision resulted in the states being allowed to opt out of this requirement.
- **Taxes.** Several new taxes help fund the program. Workers earning more than \$200,000 pay higher Medicare payroll taxes and also pay a 3.8 percent tax on their investment income. Beginning in 2022, a tax was scheduled to be imposed on employer-provided health insurance plans that have a value above \$11,200 for an individual or \$30,150 for a family—so-called *Cadillac plans*. In December 2019, Congress repealed this tax before it was implemented.

Solved Problem 7.4

The Effect of Covid–19 on U.S. Hospitals

An article in the *Wall Street Journal* noted that during the Covid–19 pandemic, hospitals had higher costs because they needed to provide doctors and nurses with personal protective equipment (PPE), increase the frequency of cleaning, and take other steps to minimize the risk of infection. At the same time, particularly during the spring and summer of 2020, many people deferred elective surgeries and even postponed necessary surgeries and tests for fear of contracting the disease, leaving hospitals with more than the usual number of empty beds and unused testing equipment despite the increase in Covid–19 patients.

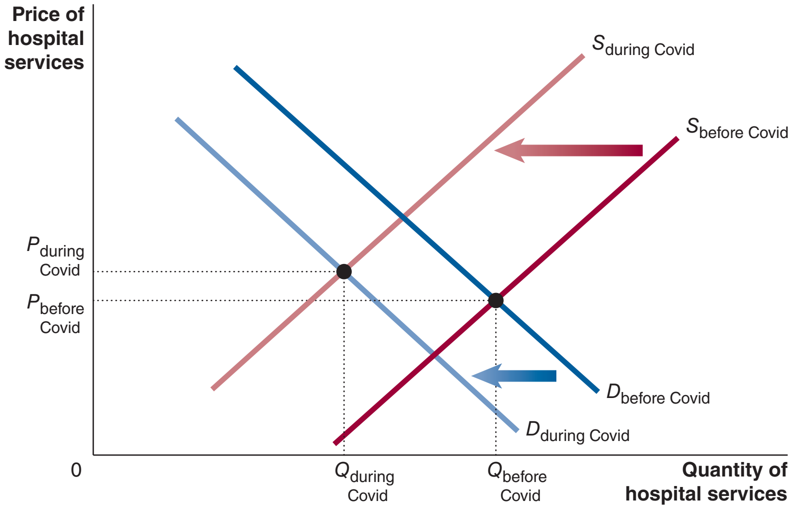
Use a graph showing the demand and supply for hospital services to analyze the effect of these factors on this market. Your graph should include (1) a demand curve and a supply curve showing the situation before Covid–19 with labels $D_{\text{before Covid}}$ and $S_{\text{before Covid}}$, and (2) a demand curve and a supply curve showing the situation once Covid–19 infections had become prevalent in the United States with labels $D_{\text{during Covid}}$ and $S_{\text{during Covid}}$. Be sure to show the direction of the shifts in the demand and supply curves during this period and changes in the equilibrium price and quantity. Briefly explain why you shifted the curves the way you did and whether you can be sure if the equilibrium price and equilibrium quantity increased or decreased. (To keep the problem simple, ignore the effects on this market of the third-party payer system, as shown in Figure 7.7.)

Solving the Problem

Step 1: Review the chapter material. This problem is about explaining changes in spending on one part of health care, so you may want to review the section "Explaining Increases in Health Care Spending."

Step 2: Answer the problem by drawing a graph of the market for hospital services that illustrates the factors mentioned in the article and by explaining the shifts in the curves and what we can conclude about changes in the equilibrium price and quantity. People were postponing some surgeries and tests even though hospitals were admitting people suffering from Covid–19, so total demand for hospital services declined, shifting the demand curve on your graph to the left, from $D_{\text{before Covid}}$ to $D_{\text{during Covid}}$. The costs of providing hospital services had increased as a result of needing to provide hospital staff with PPE and increasing the frequency of cleaning, so the supply curve on your graph should also shift to the left, from $S_{\text{before Covid}}$ to $S_{\text{during Covid}}$.

In the following graph, the supply curve has shifted to the left by more than the demand curve. As a result, the equilibrium price of hospital services has increased from $P_{\text{before Covid}}$ to $P_{\text{during Covid}}$. But based on the information given, it's possible that the demand curve shifted to the left more than did the supply curve, in which case the equilibrium price would have fallen. (You should check this point by drawing a graph with the demand curve shifting more than the supply curve to see that in that case, the equilibrium price must fall.) Notice that, because both the demand curve and the supply curve have shifted to the left, the equilibrium quantity will definitely fall from $Q_{\text{before Covid}}$ to $Q_{\text{during Covid}}$.



Your Turn: For more practice, do related problem 4.14 at the end of this chapter.

Market-Based Reforms

Market-based reforms Changes in the market for health care that would make it more like the markets for other goods and services.

Some economists and policymakers support **market-based reforms**, which involve restructuring the market for health care so that it becomes more like the markets for other goods and services. With such reforms, the prices consumers pay and suppliers receive would do a better job of conveying information on consumer demand and supplier costs. The expectation is that increased competition among doctors, hospitals, pharmaceutical companies, and other providers of health care would reduce costs and increase economic efficiency, as happens in the markets for most other goods and services. Currently, markets are delivering inaccurate signals to consumers because when buying health care, consumers pay a price well below the true cost of providing the service.

Supporters of market-based reforms note that employees have to pay federal income and payroll taxes on the wages their employers pay them, but in most circumstances employees do not pay taxes on the value of the health insurance their employers provide them. As mentioned earlier, this feature of the tax laws encourages employees to want generous health care coverage; in fact, if offered the choice between a $1,000 salary increase or increased health care coverage worth $1,000, many people would choose the increased health care coverage because it would be tax free (although someone who was young and healthy and did not expect to have medical bills would probably choose the increase in salary). The size of this tax break is quite substantial—an estimated $225 billion in total for U.S. taxpayers in 2022, which is expected to rise to $434 billion in 2032. But individuals typically get no tax break when buying an individual health insurance policy or when they spend money on health care out of pocket.*

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* Individuals receive a deduction on their federal income tax only if their medical expenses are greater than 10 percent of their income. Only a relatively small number of individuals have expenses high enough to use that deduction. Self-employed individuals can typically deduct the cost of health insurance from their income when paying their federal income tax.

Some economists have proposed making the tax treatment of employer-provided health insurance the same as the tax treatment of individually purchased health insurance and out-of-pocket health care spending. They argue that this change could significantly reduce spending on health care without reducing the effectiveness of the health care received. Such tax law changes would make it more likely that employer-provided health insurance would focus on large medical bills—such as those resulting from hospitalizations—while consumers would pay prices closer to the costs of providing routine medical care. John Cogan of the Hoover Institution, Glenn Hubbard of Columbia University, and Daniel Kessler of Stanford University estimated that repealing the tax preference for employer-provided health insurance would reduce spending by people enrolled in these programs by 33 percent.

Currently, the U.S. health care system is a world leader in innovation in medical technology and prescription drugs. About two-thirds of pharmaceutical patents are issued to U.S. firms, and about two-thirds of research on new medicines is carried out in the United States. One goal of market-based reforms would be to ensure that U.S. firms continue with innovations in medical screening equipment, surgical procedures, and prescription drugs. Executives of U.S. pharmaceutical firms have voiced concern over whether recent proposals to impose government controls on prescription drug prices will affect their ability to profitably bring new prescription drugs to market.

Apply the Concept

Should Congress Increase the Federal Government's Role in Providing Health Care?

Hero Images Inc./Alamy Stock Photo

Should the current health care system be replaced with Medicare for All, under which the government would be the sole provider of health insurance?

Two policy proposals to significantly expand the federal government's role in the health care system continue to be the subject of considerable debate: (1) Medicare for All (MFA) and (2) a public option. Although as of late 2023, Congress seemed unlikely to enact either proposal, the debate over them is worth considering because it raises important issues about health care policy.

Policymakers who support MFA propose a system that would provide health care for everyone in the United States, using the Medicare program as a model. Congress established the Medicare program in 1965 to provide health care to people aged 65 and older. Although the system has become complex, under Medicare, the federal government provides health insurance that pays for most—but not all—types of medical care for this age group. People who enroll in Medicare pay an insurance premium, partially based on their income, and must meet deductibles and make coinsurance payments.

Under the most frequently discussed version of MFA, only the federal government would offer health insurance, so MFA is considered a *single-payer plan*. Unlike with traditional Medicare, under MFA, people would not be charged an insurance premium and would not pay deductibles or coinsurance. Patients could see a doctor, have medical testing, or undergo surgery without being required to pay any fees. MFA would eliminate the current system, which relies on private health insurance companies to provide medical coverage for people not enrolled in the Medicare, Medicaid, or Veterans Health Administration programs. Doctors would not become government employees, and the federal government would not take over privately owned hospitals. So MFA, unlike the United Kingdom's National Health Service, is not socialized medicine.

Supporters of MFA see the following advantages:

- **Universal coverage.** The program would eliminate the problem of some people going without health insurance. It would also eliminate differences in coverage that exist today among the many private health insurance plans. Some versions of the MFA proposal include vision, hearing, and dental care coverage that is typically not part of existing private insurance plans or of traditional Medicare.

- **Less paperwork for patients.** As Vice President Kamala Harris put it while running for the Democratic nomination for president in 2020: "The idea is that everyone gets access to medical care, and you don't have to go through the process of going through an insurance company, having them give you approval, going through the paperwork, all of the delay that may require."
- **Less paperwork for administrators.** The U.S. health care system is decentralized, made up of many independent doctors, hospitals, pharmacies, insurance companies, pharmaceutical companies, and medical device manufacturers that are overseen by local, state, and federal government agencies. Under MFA, a centralized federal system would standardize record keeping and potentially reduce the administrative cost of coordinating a decentralized system.
- **Cost savings due to the bargaining power of the federal government.** Under MFA, the federal government would be the sole payer to providers of medical services. Supporters of the proposal believe that this structure would give the federal government the leverage needed to reduce the prices of prescription drugs, hospital stays, and doctors' fees.

The opponents of MFA see the following drawbacks to the program:

- **Very high cost.** The cost of MFA is uncertain because the details of different proposals vary somewhat and because the changes to the current system are so far-reaching. Charles Blahous of the Mercatus Center at George Mason University estimates that MFA would require an increase in federal government spending of $32.6 *trillion* over its first 10 years in operation. John Holahan and colleagues at the Urban Institute, a nonprofit organization that analyzes social and economic policy proposals, have arrived at a similar estimate of $32.0 trillion over 10 years. In 2022, the federal government spent $6.2 trillion on all programs combined, so the necessary increase in spending would be very large, and to fund the spending, Congress would need to greatly increase taxes. Some economists believe that even these cost estimates are too low because they assume that the federal government will successfully reduce the fees now charged by doctors, hospitals, and pharmaceutical companies, which may prove difficult. Supporters of the plan argue that the estimates are too high because they underrate the savings in administrative and other costs resulting from MFA.
- **Reduced flexibility.** Because MFA would be a centralized program administered from Washington, DC, by government employees, it would provide standardized care and enforce standardized procedures throughout the country. Opponents argue that the program would eliminate the flexibility offered by a decentralized system that can respond to different medical needs in different geographic areas.
- **Reduced medical innovation.** Opponents of MFA worry that the low prices the federal government would impose on pharmaceutical companies and manufacturers of medical devices would reduce the incentive those firms have under the current system to introduce new and innovative products. The result might be to slow the improvement in health care outcomes we discussed in Section 7.1.
- **Increased moral hazard problems.** We saw in Section 7.3 that the current third-party payer system of health care gives people with health insurance an incentive to overuse the system by, for instance, visiting the doctor for treatments of minor problems such as colds and by requesting unnecessary tests. MFA would increase these problems by eliminating deductibles and coinsurance. Increased usage raises the possibility that MFA would result in longer delays in making appointments, scheduling tests, and receiving treatment.

During the 2020 presidential campaign and at the beginning of his presidency, Joe Biden proposed a public option as an alternative to MFA. Unlike with MFA, under a public option, the current employer-based system of health insurance would not be eliminated. Instead, it would coexist with a system of government-run health insurance similar to Medicare but available to anyone, rather than only to people 65 and older. People enrolled in the public option would pay premiums set below the premiums private insurance companies currently charge on the ACA state health insurance marketplaces. In addition, President Biden proposed lowering the age to enroll in traditional Medicare to 60 and increasing the subsidies people receive when buying health insurance on the state health insurance marketplaces.

Critics of President Biden's plan are concerned that because the premiums for the public option would be set below those charged by private insurance companies, consumers would shift to the public option, eventually driving the private insurance companies out of the market. If this outcome occurred, the public option would eventually become something close to the MFA plan.

Although President Biden estimated that his plan would require $750 billion in new spending over 10 years—far less than the spending required to implement MFA—critics were concerned that the actual spending required might be much higher. As of late 2023, it seemed unlikely that Congress would pass legislation establishing a public option system of the type President Biden had proposed.

Economists, policymakers, and the general public will continue to debate the best ways to improve the performance of the U.S. health care system.

Your Turn: Test your understanding by doing related problem 4.16 at the end of this chapter.

Continued from chapter opener

Economics in Your Life & Career

Is Your Take-Home Pay Affected by What Your Employer Spends on Your Health Insurance?

At the beginning of the chapter, we asked you to think about this question: Your paycheck probably doesn't show the amount your employer pays on your behalf for health insurance, but does that amount affect your take-home pay? The *Apply the Concept* "Are U.S. Firms Disadvantaged by Paying for Their Employees' Health Insurance?" shows that the equilibrium compensation that workers receive in labor markets is made up partly of wages and partly of fringe benefits such as health insurance. So, while the amount that a firm pays on your behalf for health insurance may not affect your total compensation, it will affect the amount of your take-home pay. For a given level of compensation, the more a firm pays for your health insurance, the less it will pay you in wages.

A related question is why a firm would buy health insurance for you rather than increase your wages by the same amount and let you buy your own insurance. We have seen that there are two important reasons so many people receive health insurance from their employers: (1) The wage an employer pays you is taxable income to you, but the money an employer spends to buy health insurance for you is not taxable; and (2) insurance companies are typically willing to charge lower premiums for group insurance, particularly to large employers, because risk pooling is improved and adverse selection and moral hazard problems are lower than with individual policies.

Conclusion

In this chapter, we have seen that economic analysis can provide important insights into the market for health care. As with many other policy issues, though, economic analysis can help inform the debate but cannot resolve it. The role of the government in the health care system is likely to be the subject of intense debate for years to come because health care is so important to consumers and health care services are such a large part of the U.S. economy.

CHAPTER SUMMARY AND PROBLEMS

Key Terms

Adverse selection, p. 240
Affordable Care Act (ACA), p. 228
Asymmetric information, p. 239
Fee-for-service, p. 233
Health care, p. 228
Health insurance, p. 233
Market-based reforms, p. 253
Moral hazard, p. 241
Principal–agent problem, p. 241
Single-payer health care system, p. 235
Socialized medicine, p. 235

7.1 The Improving Health of People in the United States

LEARNING OBJECTIVE: Use data to discuss trends in U.S. health over time.

Summary

Health care refers to goods and services, such as prescription drugs and consultations with a doctor, that are intended to maintain or improve health. Over time, the health of people in most countries has improved. In the United States, as a result of improving health, life expectancy has increased, death rates have decreased, infant mortality has decreased, and the average person has become taller. The **Affordable Care Act (ACA)** is health care reform legislation passed by Congress and signed by President Barack Obama in 2010.

Review Questions

1.1 Briefly discuss the most important differences between the market for health care and the markets for other goods and services.

1.2 Briefly describe changes over time in the health of the average person in the United States.

1.3 [Related to the Apply the Concept "The Demographics of Covid-19 Mortality"] Which groups in the population were overrepresented among those who died from Covid–19? Which groups were underrepresented? In what way did the demographics of Covid–19 mortality differ from the demographics of mortality in the 1918 influenza pandemic?

1.4 How can improvements in health increase a country's total income? How can increases in a country's total income improve health?

Problems and Applications

1.5 In what sense have improvements in the health of the average American caused the U.S. production possibilities frontier to shift out? Panel (a) in Figure 7.1 indicates that life expectancy in the United States declined in both 1918 and 2020–2021. What effect did these declines in life expectancy likely have on the U.S. production possibilities frontier we discussed in Chapter 2, Section 2.1? Briefly explain.

1.6 The widespread acceptance in the late 1800s of the idea that bacteria cause diseases helped lead to a public health movement. This movement eventually brought sewers, clean drinking water, and garbage removal to all U.S. cities. What effect did the public health movement in the United States in the late 1800s and early 1900s have on the country's production possibilities frontier?

1.7 An article in the *Wall Street Journal* notes that the average height in the United States has increased slowly in recent years, while the average height in the Netherlands has been increasing more steadily. For many years, the average person in the United States was taller than the average person in the Netherlands. But according to economist John Komlos of the University of Munich, in recent years the average woman in the Netherlands has been about 2 inches taller than the average woman in the United States, and the average man in the Netherlands has been about 2.5 inches taller than the average man in the United States. Income per person, or per capita, in the United States is 50 percent higher than income per person in the Netherlands. The article asks, "Why isn't the U.S., with the highest disposable income per capita of any country, the world's tallest nation?" Why might we expect a relationship between average income in a country and the average height of its residents? What might explain the difference between the average height in the United States and the average height in the Netherlands? Should policymakers be concerned about this difference? Briefly explain.

7.2 Health Care around the World

LEARNING OBJECTIVE: Compare the health care systems and health care outcomes in the United States and other countries.

Summary

Health insurance is a contract under which a buyer agrees to make payments, or premiums, in exchange for the provider agreeing to pay some or all of the buyer's medical bills. A majority of people in the United States live in households that have private health insurance, which they typically obtain through an employer. Other people have health insurance through the Veterans Health Administration or the Medicare and Medicaid programs. In 2021 about 9 percent of people in the United States lacked health insurance. Many health insurance plans operate on a **fee-for-service** basis, under which doctors and hospitals receive a payment for each service they provide. Most countries outside the United States have greater government involvement in their health care systems. Canada has a **single-payer health care system**, in which the government provides national health insurance to all Canadian residents. In the United Kingdom, the government owns most hospitals and employs most doctors, and its health care system is called **socialized medicine**. The United States spends more per person on health care than do other high-income countries; has lower life expectancy, higher infant mortality, and a greater incidence of obesity than do other high-income countries; has more medical technology per person; and has lower mortality rates for people diagnosed with cancer than do other high-income countries. Data issues and other problems make it difficult to compare health care outcomes across countries.

Review Questions

2.1 Define the following terms:
  a. Health insurance
  b. Fee-for-service
  c. Single-payer health care system
  d. Socialized medicine

2.2 What are the main sources of health insurance in the United States?

2.3 Briefly compare the health care systems in Canada, Japan, and the United Kingdom with the health care system in the United States.

2.4 What is meant by the phrase "health outcome"? How do health outcomes in the United States compare with those of other high-income countries? What problems arise in attempting to compare health outcomes across countries?

Problems and Applications

2.5 An article in the *Economist* noted that when the National Health Service (NHS) was founded in the United Kingdom in 1948, the NHS "opened its doors, providing health care for all, free at the point of use."
  a. What does "free at the point of use" mean? The same article noted that in late 2022, the NHS "has 6.8 [million] people on waiting lists, up from 4.2 [million] before the pandemic. Wards are full; people wait hours for an ambulance." Is health care actually free to residents of the United Kingdom? Briefly explain.
  b. Another article in the *Economist* suggested that the views of the average person in the United Kingdom "have made it impossible even to think about boosting NHS revenue by charging patients a nominal sum for visiting the doctor." Briefly discuss what advantages the NHS might receive if it were allowed to charge patients for doctor's visits, as happens in most other countries, including the United States. Are people reluctant to see the government take this step only because they don't want to spend money on visiting the doctor? Briefly explain.

2.6 In an opinion column in the *Washington Post*, Megan McArdle argued, "In fact, it's debatable whether the other countries' [health care] systems get better outcomes" than the health care system in the United States. Why is it difficult to measure health outcomes in a way that allows us to determine which country's system provides the best health care?

2.7 An article in the *Economist* on evaluating health outcomes is subtitled "To Improve Health Care, Governments Need to Use the Right Data." Among the data not currently being collected in most countries, the article mentioned "how soon after surgery patients get back to work." Why don't governments currently collect such data? Why might such data be important in evaluating the effectiveness of a country's health care system?

2.8 Stuart Butler of the Brookings Institution argues:

> There is much more to achieving good health than just spending money on medical care. We could save billions of dollars repairing hip fractures for seniors, for instance, by investing a fraction of that money in such things as safer bathrooms and non-slip carpeting.

Would changes of this type be observable in the health outcomes policymakers use to compare the health care systems of different countries? What insight does your answer give into such comparisons?

2.9 An article in the *Washington Post* discussing comparisons of health care systems in different high-income countries noted that "the United States is known internationally for high-quality care. And its resources and capabilities in research and development of treatments made the United States a key player in the development of coronavirus vaccines." However, the article also says that "meanwhile health care in the United States is the least affordable [among the countries being compared]. . . . U.S. doctors are the most likely to face difficulty in getting medication or treatment for patients because of restrictions on insurance coverage." Use these observations and the information in Table 7.3 to briefly discuss the difficulty in determining whether one country's health care system is more successful than another country's health care system. Your answer should indicate which goals are most important for a health care system to achieve.

2.10 **[Related to the Apply the Concept "The Increasing Importance of Health Care in the U.S. Economy"]** Eric Topol, a cardiologist, has written about the potential for using artificial intelligence (AI) in health care. He argues that in the future, many patients will have the option to receive treatment in their own bedrooms, where they can be monitored by AI rather than be admitted to hospitals. This at-home care would reduce the costs of delivering health care "because the large staff of doctors and nurses . . . would not be necessary in the future." If the U.S. health care system makes greater use of AI, what are the implications for the trends shown in the maps in the *Apply the Concept*?

7.3 Information Problems and Externalities in the Market for Health Care

LEARNING OBJECTIVE: Define information problems and externalities and explain how they affect the market for health care.

Summary

The market for health care is affected by the problem of **asymmetric information**, which occurs when one party to an economic transaction has less information than the other party. **Adverse selection**, the situation in which one party to a transaction takes advantage of knowing more than the other party to the transaction, is a problem for firms selling health insurance policies because it results in people who are less healthy being more likely to buy insurance than people who are healthier. **Moral hazard**, actions people take after they have entered into a transaction that make the other party to the transaction worse off, is also a problem for insurance companies because once people have health insurance, they are likely to make more visits to their doctors and in other ways increase their use of medical services. Moral hazard can also involve a **principal–agent problem**, in which doctors may order more lab tests, MRI scans, and other procedures than they would if their patients lacked health insurance. Insurance companies use deductibles and copayments to reduce the problems of adverse selection and moral hazard. There may be externalities involved with medicine and health care because, for example, people who are vaccinated against influenza or other diseases may not receive all of the benefits from having been vaccinated, and people who become obese may not bear all of the costs related to their obesity.

Review Questions

3.1 Define the following terms:
  a. Asymmetric information
  b. Adverse selection
  c. Moral hazard
  d. Principal–agent problem

3.2 What are the asymmetric information problems in the market for health insurance?

3.3 How do health insurance companies deal with asymmetric information problems?

3.4 What is an externality? Are there externalities in the market for health care? Briefly explain.

Problems and Applications

3.5 Suppose you see a 2020 Honda Civic hatchback advertised in the campus newspaper for $19,000. If you could be sure that the car is reliable, you would be willing to pay $20,000 for it. If you could be sure that the car is unreliable, you would be willing to pay $15,000 for it. Under what circumstances should you buy the car?

3.6 What is the *lemons problem*? Is there a lemons problem in the market for health insurance? Briefly explain.

3.7 An article in the *Wall Street Journal* refers to "the basic principle of insurance—pooling risk in order to minimize liability from unforeseen dangers." In what sense does insurance involve pooling risks? How does the problem of adverse selection affect the ability of insurance to provide the benefit of pooling risk?

3.8 Researchers from Johns Hopkins University's Carey Business School examined health insurance data for nearly 3,000 chronically ill consumers. The researchers found that most consumers choose insurance plans that covered surgeries and drugs to improve the patient's health rather than less expensive preventive care plans that help keep illnesses from getting worse. Jian Ni, a coauthor of the study, explains that some consumers choose a more costly plan, even if they don't need it, because "the insurer will pay for the bulk of it." Ni believes that these consumers create moral hazard problems that "[contribute] to health care expenses . . . that are higher than they probably should be."
  a. What is moral hazard?
  b. Most consumers in this study chose expensive health insurance plans that covered surgeries and drugs rather than less costly preventive plans. Why does a coauthor of the study describe this behavior as an example of moral hazard?
  c. Why would moral hazard cause health care expenses to be "higher than they probably should be"?

3.9 **[Related to the Don't Let This Happen to You]** Briefly explain whether you agree with the following statement: "The reluctance of healthy young adults to buy health insurance creates a moral hazard problem for insurance companies."

3.10 **[Related to the Don't Let This Happen to You]** While teaching the concepts of asymmetric information, a professor asked his students for examples of adverse selection or moral hazard in marriage. One of the students, who happened to be married, replied: "Your spouse doesn't bring you flowers anymore!" Would the student's reply be an example of adverse selection or moral hazard? Briefly explain.

3.11 In an opinion column in the *Washington Post*, Daniel Morgan of the University of Maryland's School of Medicine described the result of a study he carried out with colleagues: "We found that nearly 90 percent of the patients received at least one unnecessary [medical] test and that, overall, nearly one-third of all the tests were superfluous." Why would hospitals and doctors perform tests that may not be of any value to patients? Are there features of the U.S. health care system that might be encouraging this behavior? Briefly explain.

3.12 An article in the *New York Times* observed, "American doctors often rail against the country's medical malpractice system, which they say forces them to order unnecessary tests and procedures to protect themselves if a patient sues them." Is there another economic explanation—apart from fear of lawsuits—for why doctors may end up ordering unnecessary tests and other medical procedures? Briefly explain.

3.13 An article in the *Economist* argued that the real problem with health insurance is as follows:

> The healthy people who decide not to buy insurance out of rational self-interest, and who turn out to be right. By not buying insurance, those (largely young) healthy people will

be failing to subsidize the people insurance is meant for: the ones who end up getting sick.

a. Why is it rational for healthy people not to buy health insurance?

b. Do you agree that health insurance is meant for people who end up getting sick?

c. Briefly explain whether the situation described here is a problem for the health insurance system. If the situation is a problem, suggest possible solutions.

3.14 Explain whether you agree with the following statement:

> Providing health care is obviously a public good. If one person becomes ill and doesn't receive treatment, that person may infect many other people. If many people become ill, then the output of the economy will be negatively affected. Therefore, providing health care is a public good that should be supplied by the government.

7.4 The Debate over Health Care Policy in the United States

LEARNING OBJECTIVE: Explain the major issues involved in the debate over health care policy in the United States.

Summary

Spending on health care in the United States has been growing rapidly as a percentage of GDP, and spending per person on health care has been growing more rapidly in the United States than in other high-income countries. Third-party payers, such as employer-provided health insurance and the Medicare and Medicaid programs, have financed an increasing fraction of health care spending, while out-of-pocket payments have sharply declined as a fraction of total health care spending. Several explanations have been offered for the rapid increase in health care spending in the United States: Slow rates of growth of labor productivity in health care may be driving up costs, the U.S. population is becoming older, medical technology and new prescription drugs cost more, and the tax system and the reliance on third-party payers have distorted the economic incentives of consumers and suppliers of health care. In 2010, Congress passed the Affordable Care Act (ACA), which significantly reorganized the U.S. health care system. The ACA has several important provisions: (1) the establishment of health exchanges that will be run by the state or federal governments and provide a means for individuals and small businesses to purchase health insurance; (2) an employer mandate that requires every firm with more than 200 employees to offer health insurance to them; (3) increased regulation of health insurance companies; (4) expansion of eligibility for Medicaid; and (5) increased taxes on people with incomes above $200,000. (The ACA also had an individual mandate that required every resident of the United States to obtain health insurance or pay a fine, but Congress repealed that provision in 2017.) Some critics of the ACA argue that it does not go far enough in increasing government involvement in the health care system, while other critics argue that health care reform should rely more heavily on **market-based reforms**, which involve changing the market for health care so that it becomes more like the markets for other goods and services.

Review Questions

4.1 What is the Affordable Care Act (ACA)? Briefly list its major provisions.

4.2 In the United States, what has been the trend in health care spending as a percentage of GDP? Compare the increases in health care spending per person in the United States with the increases in health care spending per person in other high-income countries. What implications do current trends in health care spending have for the growth of federal government spending in the United States?

4.3 Briefly discuss how economists explain the rapid increases in health care spending.

4.4 Why do some economists and policymakers believe that the federal government should increase its role in the U.S. health care system? Why do some economists and policymakers believe that the U.S. health care system should rely more on market mechanisms than the ACA does and more than would the proposed Medicare for All system or a public option of the type President Biden has proposed?

4.5 **[Related to the Economics in Your Life & Career]** If the federal government paid for all medical care, as in the Medicare for All proposal, would the wages you receive from your employer likely rise or fall? Briefly explain.

Problems and Applications

4.6 The Congressional Budget Office forecasts that less than half of the future increase in spending on Medicare and Medicaid as a percentage of GDP will be due to the aging of the population. What factors (other than the rising average age of the U.S. population) explain most of the increase?

4.7 Improvements in technology usually result in lower costs of production or new and improved consumer goods and services. Assume that an improvement in medical technology results in an increase in life expectancy for people 65 years of age and older. How would this technological advance be likely to affect expenditures on health care?

4.8 Stanford Hospital, located in Palo Alto, California, uses advanced technologies to improve the experience of both patients and caregivers. Brian Kalis, managing director for digital health and innovation for Accenture PLC's health business, believes the hospital's technologies "could lead to improvements in labor productivity . . . that would be beneficial given the rising demand for highly skilled labor."

a. Explain why increases in output per worker (productivity) in health care and other service industries are more difficult to achieve than increases in output per worker in manufacturing industries.

b. Why would the use of new technologies, such as those introduced in Stanford's new hospital, "lead to improvements in labor productivity . . . that would be beneficial given the rising demand for highly skilled labor"?

4.9 Some economists and policymakers have argued that one way to control federal government spending on Medicare would be to have a board of experts decide whether new medical technologies are worth their higher costs. If the board decided that a new technology was *not* worth the cost, Medicare would not pay a bill submitted by a doctor or lab for use of the new technology. Other economists and policymakers argue that the price of any medical service received by patients enrolled in the Medicare program should more closely represent the cost of providing the medical service. This result might be attained by raising premiums, deductibles, and copayments or through “means testing,” which would limit the Medicare benefits that high-income individuals receive. *New York Times* political columnist David Brooks summarized these two ways to restrain the growth of spending on Medicare: “From the top, a body of experts can be empowered to make rationing decisions. . . . Alternatively, at the bottom, costs can be shifted to beneficiaries with premium supports to help them handle the burden.”

a. What are “rationing decisions”? How would such decisions restrain the growth of Medicare spending?

b. How would shifting the costs of Medicare to beneficiaries restrain the growth of Medicare spending? What does Brooks mean by “premium supports”?

c. Should Congress and the president be concerned about the growth of Medicare spending? If so, which of these approaches should they adopt, or is there another approach that might be better? (*Note*: This question is normative and has no definitive answer. It is intended to lead you to consider possible approaches to the Medicare program.)

4.10 The late Nobel Laureate Robert Fogel of the University of Chicago argued, “Expenditures on health care are driven by demand, which is spurred by income and by advances in biotechnology that make health interventions increasingly effective.”

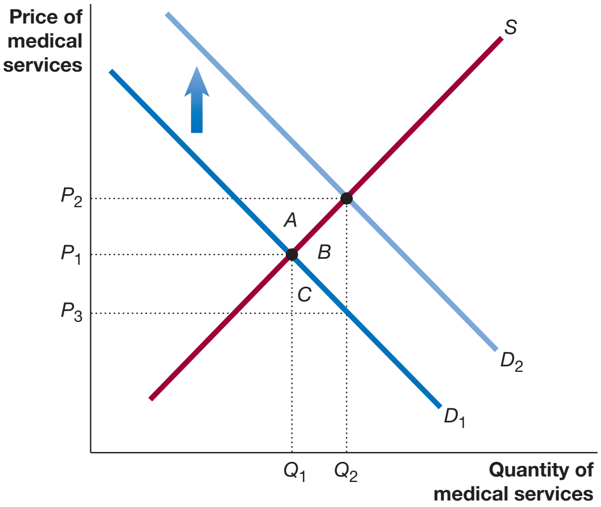
a. If Fogel was correct, should policymakers be concerned about projected increases in health care spending as a percentage of GDP?

b. What objections do some economists raise to Fogel’s analysis of what is driving increases in spending on health care?

4.11 **[Related to the Apply the Concept “Are U.S. Firms Disadvantaged by Paying for Their Employees’ Health Insurance?”]** Employees in most circumstances do not pay taxes on the value of the health insurance provided by their employers. If employees were taxed on the value of the employer-provided health insurance, what would you expect to happen to the overall compensation employers pay employees? To the value of health insurance provided by employers? To the wages paid to employees? Briefly explain.

4.12 An article in the *Wall Street Journal* reports that “some hospitals charge up to 10 times as much as others for standard medical scans.” The article also notes: “Health economists say the disparities reveal how little influence consumers have over pricing, unlike markets for groceries or airlines, where companies vie for business by offering good deals.” What are the key differences between the market for MRI scans and the market for airline tickets? How do these differences affect the willingness of hospitals and clinics to compete by offering consumers the lowest price for an MRI scan?

4.13 Suppose consumers pay less than the true cost of medical services because a third party, such as an insurance company or the government, pays most of the bill. In the following graph, D_1 represents the demand for medical services if consumers paid the full price of medical services; D_2 represents the demand for medical services when consumers pay only a fraction of the true cost of medical services; and S represents the supply of medical services. Use the graph to answer the following questions. Briefly explain your answers.



a. What is the equilibrium market price received by doctors and other suppliers of medical services?

b. What is the efficient quantity of medical services?

c. What is the price paid by consumers of medical services?

d. Which area represents the deadweight loss resulting from consumers not paying the full price of medical services?

4.14 **[Related to Solved Problem 7.4]** Gary Shapiro is the head of the Consumer Technology Association. In an opinion column in the *Wall Street Journal*, he argues that once people begin wearing micro-electrical-mechanical systems (MEMSs), the costs of providing health care will fall: “Without asking a single question, your doctor could chart your physical activity and check your hydration, sodium and oxygen levels without using a needle.” Suppose that the devices also increase the demand for medical care by making it more likely that people will discover health problems. Use a graph of the market for medical services to show the potential effect of MEMSs becoming widely used, assuming that these systems are able to provide the benefits their supporters expect. Explain any shifts in the demand curve or supply curve and the effect on the equilibrium price and quantity of medical services. Can we be certain whether the equilibrium price of medical services will increase? Briefly explain.

4.15 An article in the *New York Times* noted that at the time he took office, President Biden “supported the idea of a public option: a government-run health plan that all Americans could choose to buy into—but not the Medicare for all system.”

- **a.** What are the main problems with the U.S. health care system that a public option and the Medicare for All system would attempt to solve?
- **b.** What are key differences between a public option and Medicare for All?
- **c.** What are the key differences between market-based reforms, on the one hand, and a public option or Medicare for All on the other?

4.16 **[Related to the Apply the Concept "Should Congress Increase the Federal Government's Role in Providing Health Care?"]** An article in the *New York Times* observes, "At the heart of the 'Medicare for all' proposals championed by Senator Bernie Sanders and many Democrats is a revolutionary idea: Abolish private health insurance." What potential benefits do supporters of Medicare for All expect from abolishing private health insurance? What potential problems do opponents of Medicare for All foresee in abolishing private health insurance?

4.17 Some firms offer their employees health care plans with high deductibles, sometimes as much as $4,500 per year. What effect do high-deductible plans have on how often employees visit doctors or otherwise use health care services? If the federal government were to require that employer health care plans have deductibles that were no greater than $200 per year, would the employees in these plans be better off? Would the employers offering these plans be worse off? Briefly explain.

Critical Thinking Exercises

CT7.1 After graduation, you accept a job with a new small startup. Your manager asks you to evaluate health insurance plans and identify which plan is most likely to help attract good employees. One idea she proposes is to offer employees health insurance with no deductibles and no copays. What advice might you give your manager? After hearing your advice, she asks if offering more generous health insurance will increase the total employee compensation she will need to offer employees over the next 10 years. Use concepts from the chapter to answer these questions.

CT7.2 From a news site, locate two articles that advocate specific changes in the U.S. health care system. Avoid news articles that only describe the debate over health care. Instead, try to locate articles that present arguments in favor of *specific changes*. How would you describe the differences between the proposals presented in the two articles? Would it be possible for Congress and the president to enact both proposals? Briefly explain.

CT7.3 Employers who offer health insurance typically allow existing employees to enroll or change their coverage just once a year during "open enrollment" in the fall. Why might employers not allow their existing employees to enroll in health insurance or change their coverage any time they like? (Note: New employees can enroll in health insurance when they start their job.)

8 Firms, the Stock Market, and Corporate Governance

Why Did Elon Musk Turn X into a Private Firm?

Twitter account of Elon Musk/AFP/Getty Images

Social media apps like Instagram, X (formerly named Twitter), and TikTok have come to play an important role in many people's lives. According to some estimates, the average person spends more than two hours per day on social media. In one survey, 80 percent of social media users in the United States said they use a social media app at least once per day, and 59 percent do so several times per day. Some social media *influencers* have gained millions of followers, and companies pay them substantial amounts to endorse their products.

X is among the most controversial social media apps because many people have used it to debate social, political, and economic policy issues. Elon Musk, who joined X (then named Twitter) in 2009, often participated in some contentious Twitter debates. Musk became a billionaire as a result of being chief executive officer (CEO) first of PayPal, the online payment system, and then of Tesla, SpaceX, and the Boring Company.

X was founded (as Twitter) in 2006 by Jack Dorsey and partners. Until 2013, X was a *private firm*, which means that it did not sell stock to the general public on financial markets. X became a *public firm* on November 7, 2013, when it began selling stock on the New York Stock Exchange. Initially, its stock had a price of $26, and the firm raised $1.8 billion by selling 70 million shares of stock. In going public, X was following the path of many startup firms, including Facebook, Snapchat, Uber, and Lyft. Once a firm goes public, it has access to greater financing because it can sell its stock and bonds to many investors. But a public firm faces pressure from those investors to earn a profit. Musk had been critical of X's failure to earn a profit in 2020 and 2021. In January 2022, Elon Musk became the largest investor in X when he purchased more than 9 percent of the firm's stock. He had also criticized the firm's managers for banning some people from the site and for deleting posts that the managers believed were misleading. Musk argued that these actions interfered with free speech.

In August 2022, Musk bought the remaining shares of X's stock for $44 billion. By purchasing all of the firm's stock, Musk was able to convert X to being a private firm. A public corporation is controlled by a board of directors, whose members are elected by the corporation's shareholders. The board of directors appoints the corporation's top management, including the CEO. Musk initially acted as X's CEO before appointing Linda Yaccarino, former head of advertising at NBCUniversal, as CEO in June 2023. In July 2023, Musk changed Twitter's name to X.

Why did Elon Musk not keep X a public firm but instead take it private? There are three main advantages to being a private firm: (1) The owner of a private firm can take actions that he or she believes are in the best interests of the firm without worrying about how the firm's stockholders might react; (2) public firms are required to report their revenue, costs, and profits every three months, but private firms are not; and (3) the federal Securities and Exchange Commission (SEC) closely regulates the activities of public firms in the interest of protecting those firms' stockholders. Private firms are less tightly regulated. As noted earlier, a key downside to being a private firm is that private firms can't raise funds by selling stocks and bonds on financial markets.

In this chapter, we'll see that well-functioning financial markets are crucial to the health of economy. Financial markets are also important to households as they accumulate savings to buy houses, pay for college, and prepare for retirement.

Chapter Outline & Learning Objectives

8.1 Types of Firms, page 266
Categorize the major types of firms in the United States.

8.2 How Firms Raise Funds, page 272
Explain how firms raise the funds they need to operate and expand.

8.3 Using Financial Statements to Evaluate a Corporation, page 281
Describe the information corporations include in their financial statements.

Appendix: Using Present Value, page 292
Explain the concept of present value.

Online Appendix: Income Statements and Balance Sheets
Describe the information contained on a firm's income statement and balance sheet.

Economics in Your Life & Career

Is an Ad-Free Version of X Likely to Be More Profitable for Elon Musk?

You can use X (formerly named Twitter) for free—or can you? Social media apps don't charge you directly; instead, they earn their revenue primarily by displaying ads as you use the app. Most sites collect data about your web searches and browsing habits and then display ads for products they think you might buy. But many people see these targeted ads as an invasion of their privacy.

Suppose Elon Musk hires you to work at X as an economist. He wants you to evaluate the decision he made in December 2022 to introduce a service, which—for a fee of $8 to $11 per month—would allow users to edit posts and to see only half the ads seen by people using the app for free. He was also considering offering a higher-priced service that would allow users to see no ads at all. What factors would you need to take into account in evaluating whether these services were likely to make X significantly more profitable? As you read this chapter, try to answer this question. You can check your answer against the one we provide at the end of this chapter.

In this chapter, we look at firms: how they are organized, how they raise funds, and the information they provide to investors. As we have discussed in earlier chapters, firms in a market system are responsible for organizing the factors of production to produce goods and services. Entrepreneurs start firms to earn a profit by offering goods or services. To succeed, entrepreneurs must meet consumers' wants by producing new or better goods and services or by finding ways to produce existing goods and services at a lower cost so that they can be sold at a lower price than by competing firms. Entrepreneurs also need access to sufficient funds, and they must be able to efficiently organize production. As the typical firm in many industries has become larger over the past 100 years, the task of efficiently organizing production has become more difficult. Therefore, we also look at problems of *corporate governance* that are particularly likely to occur in large firms.

8.1 Types of Firms

LEARNING OBJECTIVE: Categorize the major types of firms in the United States.

In studying a market economy, it is important to understand the basics of how firms operate. In the United States, there are three main categories of firms:

Sole proprietorship A firm owned by a single individual and not organized as a corporation.

Partnership A firm owned jointly by two or more persons and not organized as a corporation.

Corporation A legal form of business that provides owners with protection from losing more than their investment should the business fail.

1. A **sole proprietorship** is a firm owned by a single individual. Although most sole proprietorships are small, some employ many workers and earn large profits.
2. A **partnership** is a firm owned jointly by two or more—sometimes many—persons. Most law and accounting firms are partnerships. Some of them can be quite large. For instance, in 2023, the Baker McKenzie law firm, based in Chicago, had more than 600 partners who jointly owned the firm.
3. A **corporation** is a legal form of business that provides owners with protection from losing more than their investment in the firm should the business fail. Most large firms are organized as corporations.

Who Is Liable? Limited and Unlimited Liability

Asset Anything of value owned by a person or a firm.

A key distinction among the three types of firms is that the owners of sole proprietorships and partnerships have unlimited liability, which means there is no legal distinction between the personal assets of the owners of the firm and the assets of the firm. An **asset** is anything of value owned by a person or a firm. If a sole proprietorship or a partnership owes money to the firm's suppliers or employees, the suppliers and employees have a legal right to sue the firm for payment, even if it means the firm's owners have to sell some of their personal assets, such as stocks or bonds, to pay their debts. In other words, with sole proprietorships and partnerships, the owners are not legally distinct from the firms they own.

Limited liability A legal provision that shields owners of a corporation from losing more than they have invested in the firm.

It may seem fair that the owners of a firm should be responsible for the firm's debts. But in the early 1800s, many state legislatures in the United States realized that unlimited liability was a significant obstacle for any firm that was attempting to raise funds from large numbers of investors. An investor might be interested in making a small investment in a firm but might be unwilling to become a partner in the firm for fear of placing at risk all of his or her personal assets if the firm were to fail. To get around this problem, state legislatures began to pass *general incorporation laws*, which allowed firms to more easily be organized as corporations. Under the corporate form of business, the owners of a firm have **limited liability**, which means that if the firm fails, the owners can never lose more than the amount they have invested in the firm. In other words, the owners of the firm do not risk losing their personal assets. In fact, in the eyes of the law, a corporation is a legal "person," separate from its owners. Limited liability has made it possible for corporations to raise funds by issuing shares of stock to large numbers of investors. For example, if you buy a share of Uber stock, you are a part owner of the ride-hailing and food delivery firm, but if Uber goes bankrupt, you would not be personally responsible for

Table 8.1 **Differences among Business Organizations**

	Sole Proprietorship	Partnership	Corporation
Advantages	• Control by owner • No layers of management	• Ability to share ownership responsibilities • Ability to share risks	• Limited personal liability • Greater ability to raise funds
Disadvantages	• Unlimited personal liability • Limited ability to raise funds	• Unlimited personal liability • Limited ability to raise funds	• Costly to organize • May face double taxation of its profits

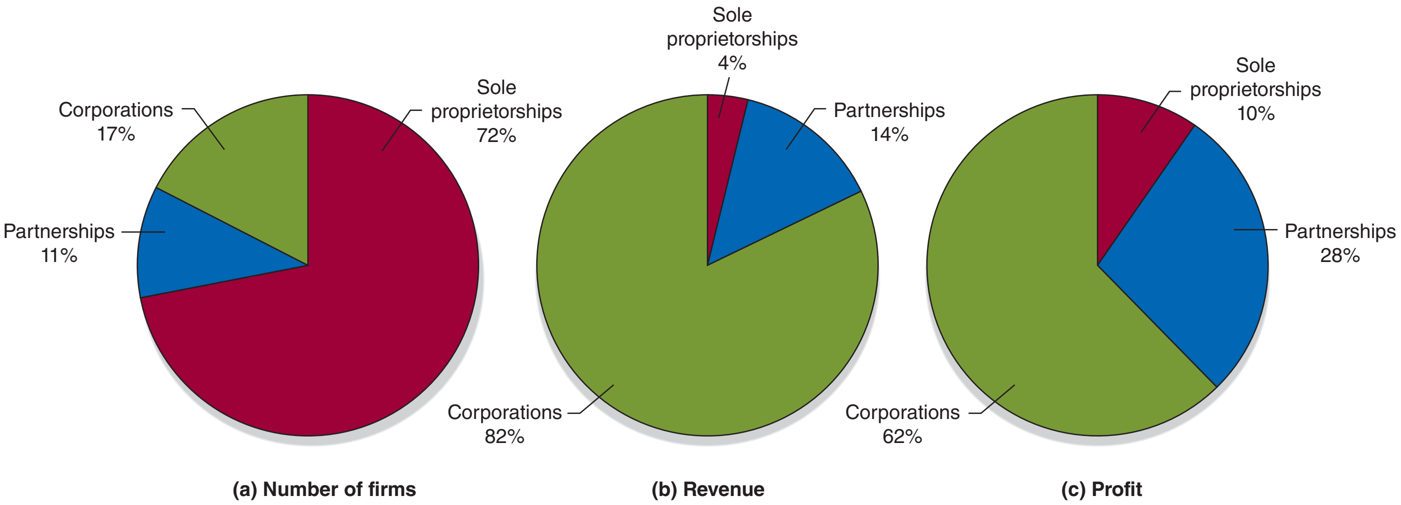
any of the firm's debts. Therefore, you could not lose more than the amount you paid for the stock.

Organizing a firm as a corporation also has some disadvantages. In the United States, corporate profits are taxed twice—once at the corporate level and again when investors in the firm receive a share of the firm's profits. Corporations generally are larger than sole proprietorships and partnerships and are therefore more difficult to organize and run. (Note also, as we discussed in the chapter opener, that some corporations, like Uber, are public firms and some corporations, like X after Elon Musk assumed ownership, are private firms.) Table 8.1 reviews the advantages and disadvantages of the three types of business organizations.

Corporations Earn the Majority of Revenue and Profits

Figure 8.1 gives basic statistics on the three types of business organizations. Panel (a) shows that almost three-quarters of all firms are sole proprietorships. Panels (b) and (c) show that although only 17 percent of all firms are corporations, they account for a majority of the revenue and profit earned by all firms. *Profit* is the difference between revenue and the total cost to a firm of producing the goods and services it offers for sale.

There are nearly 6.1 million corporations in the United States, but only 37,000 have annual revenues of more than $50 million. We can think of these 37,000 firms—including Apple, McDonald's, and Tesla—as representing "big business." These large firms earn more than 80 percent of the total profits of all corporations in the United States.



(a) Number of firms (b) Revenue (c) Profit

Figure 8.1 **Business Organizations: Sole Proprietorships, Partnerships, and Corporations**

The three types of firms in the United States are sole proprietorships, partnerships, and corporations. Panel (a) shows that only 17 percent of all firms are corporations. Yet, as panels (b) and (c) show, corporations account for a majority of the revenue and profit earned by all firms.

Source: Internal Revenue Service, "Statistics of Income."

Apply the Concept

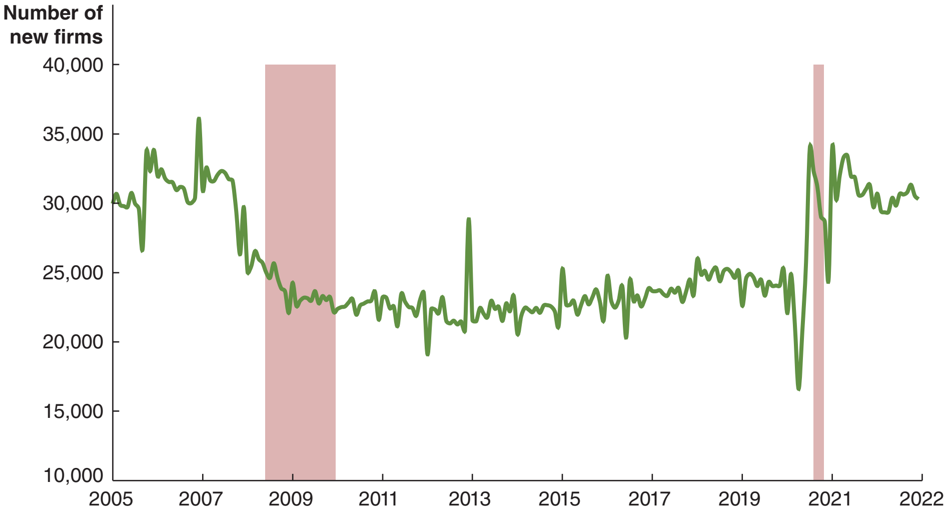
What Explains the Recent Surge in New Businesses Being Started?

Few events have had as much effect on the U.S. economy as the Covid–19 pandemic. In the spring of 2020, businesses in many parts of the country were ordered closed by state and local governments trying to contain the spread of the virus. In some areas, businesses such as restaurants remained closed for months or were allowed to operate at only a reduced capacity. Many workers were at least temporarily unemployed. The development of vaccines and large-scale spending by the federal government helped both output and employment to expand through early 2023, although some businesses still experienced slow sales due to the effects of the pandemic. This was particularly true of small businesses, which often lack the ability to borrow sufficient funds to offset temporary declines in revenue. Hit worst of all were businesses, such as restaurants and retail stores, located in the downtowns of large cities such as New York and San Francisco, where many workers continued to work from home rather than return to office buildings.

Are problems with small businesses important for the larger economy? We have seen that sole proprietorships account for only a small fraction of the total revenue and profit earned by all firms. In fact, more than 70 percent of people work at firms that have 50 or more employees.

Nevertheless, most economists would argue that small businesses are vital to the health of the economy. Starting a small firm provides an entrepreneur with a vehicle for bringing a new product or process to market. Bill Gates, Steve Jobs, Jeff Bezos, and Mark Zuckerberg decided that the best way to develop their ideas was by founding Microsoft, Apple, Amazon, and Facebook rather than by working for large corporations.

In most years, more than 400,000 new firms open in the United States, and, of these, more than 95 percent employ fewer than 20 workers. In a typical year, new small firms create 3.3 million jobs, which is more than 40 percent of all new jobs. Looking only at jobs at newly started firms, more than 85 percent of jobs created are created by small firms.



Note: Shaded areas are periods when the U.S. economy was in recession. New businesses typically need an employer identification number (EIN). A business uses this number when it pays federal taxes on its profit. The Census Bureau collects data on applications for EINs and forecasts how many new businesses are likely to be formed during the following year. These Census Bureau forecasts are graphed in the figure. Because owners of some sole proprietorships use their Social Security numbers rather than EINs when filing taxes, the procedure the Census uses misses the formation of some small firms.

Source: U.S. Census Bureau, "Projected Business Formations within Four Quarters," January 30, 2023.

Because of the importance of small firms, some economists and policymakers have been concerned by a slowdown in recent years in the number of firms started. In 1977, more than 16 percent of all firms were less than a year old. From 2010 to 2020, only about 8.5 percent of firms were less than a year old. The decline in starting new businesses wasn't concentrated in one industry or geographic area. The decline in starting new businesses had been particularly large among people under age 35. While in the 1990s about one-third of all new firms were started by people younger than 35, in the years just before the pandemic, fewer than one-quarter were. For people with a bachelor's degree, the rate of starting new businesses employing at least 10 employees fell by more than half between 1992 and 2020. Some very successful entrepreneurs, such as Steve Jobs, Bill Gates, Mark Zuckerberg, and Oprah Winfrey lacked college degrees when they started their firms. However, research by Jorge Guzman of Columbia University and Scott Stern of the Massachusetts Institute of Technology has shown that highly educated entrepreneurs are more likely to found firms that grow rapidly. Elon Musk, with degrees from the University of Pennsylvania in economics and physics, is an example.

Concern over slowing growth in new business formations was eased when, unexpectedly, the number of new businesses being opened increased sharply beginning in mid-2020. As the previous figure shows, the number of new firms declined significantly during and after the Great Recession of 2007–2009 and remained low into 2020. With the start of the Covid–19 pandemic, the opening of new businesses plunged before sharply increasing. Through the end of 2022, the formation of new businesses was the highest it had been since before the Great Recession.

What explains the pattern of new business openings being very low from 2007 to early 2020 and then substantially increasing? Economists have not reached a consensus on the reasons for the decline in business startups after 2007. Some economists believe that despite the publicity received by innovative high-tech firms, the overall U.S. economy is experiencing a slowdown in technological progress. With fewer new technologies being introduced, there are fewer opportunities to start firms that sell new goods and services. Some economists believe that an increase in government regulations has raised the costs of starting and running a small business. Here are some examples of government regulations that can make it difficult to start a new business: (1) State and local governments have imposed licensing requirements on many occupations. While in the 1950s, only 5 percent of workers were in an occupation that required licensure, today nearly 25 percent are. More than 1,100 occupations, including florist and hair braider, require a licensure in at least one state. (2) Some cities make it difficult for people to start new businesses by tightly regulating the construction of new commercial buildings. (3) Some cities put strict limits on the type and the size of businesses people can operate out of their homes.

Many economists and policymakers had worried that without an increase in young entrepreneurs starting new firms, the U.S. economy will become less dynamic and less able to sustain high rates of economic growth. Or, as one study put it, "The American economy rests crucially on the ideas and new businesses that form across the country, adding new products and innovations as well as competing with existing firms."

But, despite these concerns, as the figure shows, the number of new businesses being started increased beginning in mid-2020 and remained high through 2022. Some of these startups replaced firms that failed during the pandemic. But other startups were begun by people who had lost their jobs during the pandemic and decided the time was right to start a new business. Many of these new businesses took advantage of changes in the economy, such as more people working from home. As an article in the *Wall Street Journal* put it, "The coronavirus destroyed jobs. It also created entrepreneurs." The article quoted economist John Haltiwanger of the University of Maryland as arguing, "A working hypothesis is that individuals realize that the new normal is going to be different from the old normal." Some new businesses may have been started to take advantage of long-run changes in population growth. During 2022, business startups increased the most in Florida and Texas, where population growth has been rapid, and increased the least in the New England states, where population growth has been slower.

In 2023, it was too early to know whether the surge in business startups would be temporary as the economy finished adjusting to the changes brought on by the pandemic or whether the surge represented a return to the levels of new business formation the United States had experienced before the 2007 pandemic. Given the importance of small businesses to the economy, which of these outcomes occurs will have significant consequences for the future growth of the economy and U.S. living standards.

Your Turn: Test your understanding by doing related problems 1.8, 1.9, and 1.10 at the end of this chapter.

The Structure of Corporations and the Principal–Agent Problem

Large corporations account for a majority of revenue and profit in the economy, so it is important to know how they are managed. The way in which a corporation is structured and the effect that structure has on the corporation's behavior is referred to as **corporate governance**. Figure 8.2 shows the structure of a typical corporation.

Corporate governance The way in which a corporation is structured and the effect that structure has on the corporation's behavior.

Separation of ownership from control A situation in a corporation in which the top management, rather than the shareholders, controls day-to-day operations.

Principal–agent problem A problem caused by an agent pursuing the agent's own interests rather than the interests of the principal who hired the agent.

Unlike the owners of family businesses, the top management of a large corporation does not generally own a large share of the firm's stock, so large corporations typically have a **separation of ownership from control**. Although the shareholders actually own the firm, the top management controls the firm's day-to-day operations. Because top managers own only a small percentage of the firm's stock, they may decrease the firm's profit by spending money to purchase private jets or schedule management meetings at luxurious resorts. The conflict between the interests of shareholders and the interests of the top management is called the **principal–agent problem**.* This problem occurs when agents—a firm's top management—pursue their own interests rather than the interests of the principal who hired them—the shareholders of the corporation. Because the outside directors are not involved with the daily operations of the firm, they may have difficulty deciding whether the actions top managers take really are in the best interests of shareholders. To reduce the effects of the principal–agent problem, beginning in the 1990s, many boards of directors began to tie the salaries of top managers to the firm's profit or to the price of the firm's stock. They hoped this step would give top managers an incentive to make the firm as profitable as possible, thereby benefiting its shareholders. Sometimes, though, top managers act in ways that increase the profit of the firm in the short run—and the salaries and bonuses of the top managers—but actually reduce the profit of the firm in the long run.

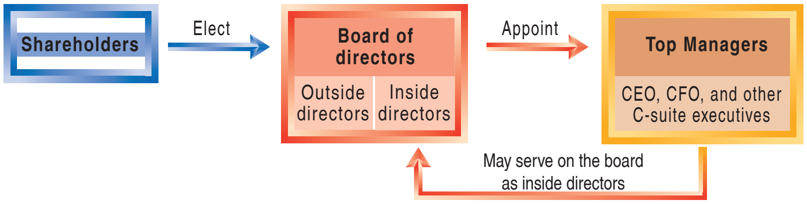


Figure 8.2 **The Structure of the Typical Corporation**

A corporation's shareholders elect a board of directors to represent their interests. The board of directors appoints a chief executive officer (CEO) to run the day-to-day operations of the corporation. Sometimes the board of directors also appoints other members of top management, such as the chief financial officer (CFO). At other times, the CEO appoints other members of top management.

Members of top management—sometimes called *C-suite executives*—including the CEO and CFO, often serve on the board of directors. They are called *inside directors*. Members of the board of directors who do not have a direct management role in the firm are called *outside directors*. The outside directors are intended to act as a check on the decisions of top managers.

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* In Chapter 7, we saw that the principal–agent problem arises from moral hazard, which can occur because of asymmetric information. In this case, the asymmetric information involves top managers knowing more about how the firm is actually run than do the firm's shareholders.

Apply the Concept

Multinational Corporations: Why Would Elon Musk Build Factories in China and Germany?

Qilai Shen/Bloomberg/Getty Images

In 2020, Elon Musk spoke at Tesla's factory in Shanghai, China.

The corporate form of business organization has proven an efficient way for firms to establish operations in foreign countries. Many large corporations have *executive committees* composed of the CEO, the chief operating officer (COO), and other C-suite executives. While lower-level managers handle the day-to-day operations of the firms, executive committees handle strategic issues such as (1) whether to introduce new products, (2) where to locate sales and production facilities, including possibly in other countries, and (3) how much of the firm's resources to devote to research and development and to marketing.

In deciding where to locate the company's production facilities, an executive committee faces trade-offs because it has only a limited amount of funds to allocate. Building a facility in one location means not being able to build a facility in another location. Long before he bought X, Elon Musk was best known for being the CEO of Tesla. In late 2019, Tesla opened a factory in Shanghai, China, and in March 2022, Tesla opened a factory in Grünheide, Germany. Why might Musk and the other members of the executive committee of a U.S.-based firm like Tesla choose to build factories in other countries rather than locate those factories in the United States? Firms might expect to increase their profits through overseas operations for five main reasons:

1. **To avoid tariffs or the threat of tariffs.** Tariffs are taxes imposed by countries on imports from other countries. Sometimes firms establish factories in other countries to avoid having to pay tariffs. For example, by having a factory in China, Tesla avoids having to pay the tariff that the Chinese government imposes on cars imported from the United States.
2. **To gain access to raw materials.** Some U.S. firms have expanded abroad to secure supplies of raw materials. U.S. oil firms—beginning with Standard Oil in the late nineteenth century—have had extensive overseas operations aimed at discovering, recovering, and refining crude oil.
3. **To gain access to low-cost labor.** In recent decades, some U.S. firms, including Apple and Nike, have located factories or other facilities in countries such as China, India, Malaysia, and Mexico to take advantage of the lower wages paid to workers in those countries.
4. **To reduce exchange rate risk.** The exchange rate tells us how many units of foreign currency are received in exchange for a unit of domestic currency. Fluctuations in exchange rates can reduce the profits of a firm that exports goods to other countries. In particular, increases in the value of the U.S. dollar can reduce foreign sales of firms that export goods from the United States.
5. **To respond to industry competition.** In some instances, companies expand overseas as a competitive response to an industry rival. Pepsi and Coke's worldwide competition for markets is an example of this kind of expansion.

All of these reasons—except for reason 2—likely influenced Tesla's decision to build factories in China and Germany. But investing in another country can carry risk as well, particularly if political relations between the United States and the other country become strained. For example, in 2023, political disputes between the United States and China prompted some U.S.-based firms to reconsider their investments in China. Tesla received loans from Chinese banks to build its Shanghai factory. Some U.S. policymakers were concerned that those loans might make the company more likely to share technology with Chinese firms or the Chinese government. Elon Musk also owns SpaceX, which produces satellites for the U.S. government using classified technology. As of late 2023, there was no indication, however, that Tesla had plans to reduce its production in China.

Your Turn: Test your understanding by doing related problem 1.14 at the end of this chapter.

8.2 How Firms Raise Funds

LEARNING OBJECTIVE: Explain how firms raise the funds they need to operate and expand.

Owners and managers operate firms to earn a profit. To succeed, a firm must raise funds to pay for its operations, including paying its employees and buying or renting computers and other machinery and equipment. In fact, a central challenge for anyone running a firm, whether that person is a sole proprietor or a top manager of a large corporation, is raising the funds needed to operate and expand the business. Suppose you develop a new social media app, and you decide to start a business using $100,000 you have saved in a bank. You use the $100,000 to rent an office, buy computers and other information technology, and pay other startup expenses. Your firm is a great success, and you decide to expand it by moving to a larger office and buying more information technology. As the owner of a small business, you can raise the funds for such an expansion in three ways:

1. If you are making a profit, you can reinvest the profit back into your firm. Profits that are reinvested in a firm rather than taken out of the firm and paid to the firm's owners are called *retained earnings*.
2. You can raise funds by recruiting additional owners to invest in the firm. This arrangement would increase the firm's *financial capital*.
3. You can borrow the funds from relatives, friends, or a bank.

The managers of a large public firm have some additional ways to raise funds, as we will see in the next section.

Sources of External Funds

Unless firms rely on retained earnings, they have to raise the *external funds* they need from those who have funds available to invest. It is the role of an economy's *financial system* to transfer funds from savers to firms and other borrowers.

Indirect finance A flow of funds from savers to borrowers through financial intermediaries such as banks. Intermediaries raise funds from savers to lend to firms (and other borrowers).

Most firms raise external funds in two ways. The first way, called **indirect finance**, relies on financial intermediaries such as banks. If you put $1,000 in a checking account or in a certificate of deposit (CD), the bank will loan most of those funds to borrowers. The bank will combine your funds with those of other depositors and, for example, make a $100,000 loan to a local business. Small businesses rely heavily on bank loans as their primary source of external funds.

Direct finance A flow of funds from savers to firms through financial markets, such as the New York Stock Exchange.

A second way for firms to acquire external funds is through *financial markets*. Raising funds in these markets, such as the New York Stock Exchange on Wall Street in New York City, is called **direct finance**. Direct finance usually takes the form of the borrower selling a *financial security* to the lender. A financial security is a document—often in electronic form—that states the terms under which the funds pass from the buyer of the security (who is lending funds) to the borrower. *Bonds* and *stocks* are the two main types of financial securities. Typically, only large corporations are able to sell bonds and stocks on financial markets. Investors are generally unwilling to buy securities issued by small and medium-sized firms because the investors lack sufficient information on the financial health of smaller firms.

Bond A financial security that represents a promise to repay a fixed amount of funds.

Coupon payment An interest payment on a bond.

Interest rate The cost of borrowing funds, usually expressed as a percentage of the amount borrowed.

Bonds A **bond** is a financial security that represents a promise to repay a fixed amount of funds. When Apple sells a bond to raise funds, it promises to pay the purchaser of the bond an interest payment each year for the term of the bond, as well as a payment of the loan amount, or the *principal*, at the end of the term. Apple may need to raise many millions of dollars to build new offices, but each individual bond has a principal, or *face value*, of $1,000, which is the amount each bond purchaser is lending Apple. So, Apple must sell many bonds to raise all the funds it needs. Suppose Apple promises it will pay interest of $40 per year to anyone who buys one of its bonds. The interest payments on a bond are called **coupon payments**. The **interest rate** is the cost of borrowing funds, usually expressed as a percentage of the amount borrowed. We can calculate the interest rate on a bond, called the *coupon rate*, by dividing the coupon payment by the face value of the bond. In this case, the coupon rate is:

$$\frac{\$40}{\$1{,}000} = 0.04, \text{ or } 4\%.$$

Many bonds that corporations issue have terms, or *maturities*, of 30 years. In this example, if you bought a bond from Apple, Apple would pay you $40 per year for 30 years, and at the end of the thirtieth year, Apple would repay the $1,000 principal to you.

The interest rate that a corporation selling a bond has to pay depends in part on how likely bond buyers—investors—think the corporation is to default, or not make the promised coupon or principal payments. The higher the *default risk* on a bond, the higher the interest rate will be. For example, investors see the federal government as being very unlikely to default on its bonds, so federal government bonds pay a lower interest rate than do bonds of a firm such as Apple. In turn, Apple pays a lower interest rate on its bonds than does a corporation that investors believe is not as likely to make its bond payments. The interest rate on bonds also depends on how much investors expect prices to increase in the future—the inflation rate. The higher the inflation rate, the fewer goods and services investors can buy with any given coupon payment, and so investors will require a higher coupon payment before they are willing to buy a bond. For example, suppose that Apple is able to sell bonds with a coupon of $40 when investors expect that the inflation rate in future years will be 2 percent. If investors come to expect that the inflation rate will rise to 4 percent, they may be unwilling to buy Apple's bonds unless the firm raises the coupon rate to $60 to compensate them for the effects of the higher inflation rate.

Apply the Concept

The Rating Game: Are Federal, State, or City Governments Likely to Default on Their Bonds?

Federal regulations require that firms and governments have bonds rated by one of the credit-rating agencies before they sell the bonds to investors. The three largest rating agencies are Moody's Investors Service, Standard & Poor's Corporation, and Fitch Ratings. These private firms rate bonds by giving them letter grades—AAA or Aaa being the highest—that reflect the likelihood that the firm or government will be able to make the payments on the bond. The following table shows the ratings:

	Moody's Investors Service	Standard & Poor's (S&P)	Fitch Ratings	Meaning of the Ratings
Investment-grade bonds	Aaa	AAA	AAA	Highest credit quality
	Aa	AA	AA	Very high credit quality
	A	A	A	High credit quality
	Baa	BBB	BBB	Good credit quality
Non-investment-grade bonds	Ba	BB	BB	Speculative
	B	B	B	Highly speculative
	Caa	CCC	CCC	Substantial default risk
	Ca	CC	CC	Very high levels of default risk
	C	C	C	Exceptionally high levels of default risk (for Moody's: "typically in default")
	—	D	D	Default

Note: The entries in the "Meaning of the Ratings" column are slightly modified from those that Fitch uses. The other two rating agencies have similar descriptions. For each rating from Aa to Caa, Moody's adds a numerical modifier of 1, 2, or 3 to further differentiate the ratings. The rating Aa1 is higher than the rating Aa2, and the rating Aa2 is higher than the rating Aa3. Similarly, Standard & Poor's and Fitch Ratings add a plus (+) or minus (−) sign. The rating AA+ is higher than the rating AA, and the rating AA is higher than the rating AA−.

Sources: Moody's Investors Service, rating Symbols and Definitions, January 2020; Fitch Ratings, Definitions of Ratings and Other Forms of Opinion, May 3, 2019; and Standard & Poor's, Standard and Poor's Ratings Definitions September 18, 2019.

Investors can use ratings in deciding how much risk they are willing to accept when buying a bond. Generally, the lower the rating, the higher the interest rate an investor will receive but also the higher the risk that the issuer of the bond will default.

The rating agencies charge firms and governments—rather than investors—for their services. This arrangement raises the question of whether rating agencies face a *conflict of interest*. Some economists and policymakers are concerned that because firms issuing bonds can choose which of the agencies to hire to rate their bonds, the agencies may have an incentive to give higher ratings than might be justified in order to keep the firms' business.

Some investors worry that the U.S. government might someday default on the bonds that it has sold. Since 2002, the federal government has been spending more than it has been collecting in taxes. In 2020 and 2021, the federal government greatly increased spending and cut taxes to fight the effects of the Covid–19 pandemic. These actions sharply increased the federal budget deficit. Forecasts from the U.S. Congressional Budget Office indicate that large budget deficits will continue indefinitely because, even after the worst effects of the Covid–19 pandemic have passed, spending on government programs such as Social Security, Medicare, and Medicaid is expected to increase faster than tax revenues.

In 2011, Standard & Poor's (S&P) decided that because of the continuing federal government budget deficits, it would downgrade U.S. Treasury bonds from AAA to AA+. In 2023, Fitch also downgraded Treasury bonds for the same reason. Is it likely that the U.S. Treasury will default on its bonds? S&P and Fitch argue that while a default is still unlikely, continuing large deficits increase the chance that someday the Treasury might not make the interest payments on its bonds. Most investors, though, appear confident that the Treasury will not default and continue to be willing to buy Treasury bonds.

Some investors worry that some U.S. state or city governments might default on their bonds. Many states and cities have substantial obligations to make pension payments to retired teachers and other public employees. Making these payments may be difficult without large increases in taxes or cuts in other spending. Some states and cities have decided to rely on a rating from just one rating agency rather than pay for two or more ratings. Some small investors worry that they will not have enough information from a single rating to gauge how risky a bond is. Adding to the concern are differences in how the rating agencies evaluate state and city finances. According to an article in the *Wall Street Journal*, "Moody's and Fitch impose their own calculations of pension liabilities while S&P relies more on government-provided projections." Perhaps not surprisingly, S&P was being chosen most often by states and cities that use only a single rating.

In evaluating the riskiness of bonds, investors are better off not relying entirely on the judgment of rating agencies.

Your Turn: Test your understanding by doing related problems 2.6 and 2.7 at the end of this chapter.

Stock A financial security that represents partial ownership of a firm.

Stocks When you buy a newly issued bond from a firm, you are lending funds to that firm. When you buy **stock** issued by a firm, you are actually buying part ownership of that firm. A corporation selling stock is doing the same thing owners of small businesses do when they take on a partner: The firm is increasing its financial capital by bringing additional owners into the firm. Any one shareholder usually owns only a small fraction of the total shares of stock issued by a corporation.

Many small investors buy shares of *mutual funds* rather than directly buy stocks issued by individual companies. Mutual funds, such as Fidelity Investments' Magellan Fund, sell shares to investors and use the funds to invest in a portfolio of financial assets, such as stocks and bonds. By buying shares in a mutual fund, small investors reduce the costs they would pay to buy many individual stocks and bonds. Small savers who have only enough money to buy a few individual stocks and bonds can use mutual funds to *diversify*, which lowers their investment risk because most mutual funds hold a large number of stocks and bonds. If a firm issuing stocks or bonds declares bankruptcy, causing the stocks or bonds to lose all of their value, the effect on a mutual fund's portfolio is likely to be small. The effect might be devastating, though, to a small investor who invested most of his or her savings in the bankrupt firm's stocks or bonds. Because mutual funds are willing to buy back their shares at any time, they also provide savers with easy access to their money.

Exchange-traded funds (*ETFs*) are similar to mutual funds in that when you buy shares in an ETF, you are buying a claim to a portfolio of stocks or bonds. But mutual funds can only be bought from or sold back to the firm that issues them. ETFs can be bought and sold to other investors in financial markets, just like individual stocks or bonds. And while mutual funds can only be sold at the end of the trading day (4:00 P.M. on the New York Stock Exchange), ETFs can be bought and sold throughout the day.

A shareholder is entitled to a portion of the corporation's profits, if there are any. Corporations generally keep some of their profits as retained earnings to finance future expansion. The remaining profits are paid to shareholders as **dividends**. If a firm uses its retained earnings to grow and earn an economic profit, its share price will rise, which provides a *capital gain* for investors. If a corporation is unable to make a profit, it usually does not pay a dividend. Under the law, corporations must make payments on any debt they have before making payments to their owners. That is, a corporation must make promised payments to bondholders before it can make any dividend payments to shareholders. Unlike bonds, stocks do not have maturity dates, so the firm is not obligated to return the investor's funds at any particular date.

Dividends Payments by a corporation to its shareholders.

Stock and Bond Markets Provide Capital—And Information

The original purchasers of stocks and bonds may resell them to other investors. In fact, most of the buying and selling of stocks and bonds that takes place each day involves investors reselling existing stocks and bonds to each other rather than corporations selling new stocks and bonds to investors. The buyers and sellers of stocks and bonds together make up the *stock and bond markets*. There is no single place where stocks and bonds are bought and sold. Some trading of stocks and bonds takes place in buildings known as *exchanges*, such as the New York Stock Exchange or the Tokyo Stock Exchange. In the United States, the stocks and bonds of the largest corporations are traded on the New York Stock Exchange. The development of computer technology has spread the trading of stocks and bonds outside exchanges to *securities dealers* linked by computers. These dealers comprise the *over-the-counter market*. The stocks of many high-technology firms—including Apple, Lyft, Intel, and Facebook—are traded in the most important of the over-the-counter markets, the *National Association of Securities Dealers Automated Quotations* system, which is referred to by its acronym, Nasdaq. Today, even stocks and bonds that are traded on exchanges like the New York Stock Exchange are typically traded electronically rather than face-to-face by dealers on the floor of the exchange.

Shares of stock represent claims on the profits of the firms that issue them. As the fortunes of the firms change and they earn more or less profit, the prices of the stock the firms have issued should also change. Similarly, bonds represent claims to receive coupon payments and one final payment of the principal. A particular bond that was issued in the past may have its price go up or down, depending on whether the coupon payments being offered on newly issued bonds are higher or lower than those on existing bonds. If you hold a bond with a coupon of $30 per year, and similar newly issued bonds have coupons of $40 per year, the price of your bond will fall because it is less attractive to investors. The price of a bond will also be affected by changes in *default risk*, which reflects investors' expectations of the issuing firm's ability to make the coupon payments. For example, if investors begin to believe that a firm may soon go out of business and stop making coupon payments to its bondholders, the price of the firm's bonds will fall to very low levels.

Changes in the value of a firm's stocks and bonds provide important information for a firm's managers, as well as for investors. An increase in the stock price means that investors are more optimistic about the firm's profit prospects, and the firm's managers might want to expand the firm's operations as a result. By contrast, a decrease in the firm's stock price indicates that investors are less optimistic about the firm's profit prospects, so management may want to shrink the firm's operations. Similarly, changes in the value of the firm's bonds imply changes in the cost of external funds to finance the firm's investment in research and development or in new factories. A higher bond price indicates a lower cost of new external funds, while a lower bond price indicates a higher cost of new external funds.

The Fluctuating Stock Market

When economists, investors, and policymakers are interested in measuring the performance of the stock market, they don't do so by following the price of any one company—even a company as large and important as Apple, Walmart, or General Motors. Instead, they rely on *stock market indexes*, which are averages of stock prices.

Don't Let This Happen to You

When Lyft Shares Are Sold, Lyft Doesn't Get the Money

Shares of Lyft are a popular investment, with investors buying and selling shares often as their views about the value of the firm shift. That's great for Lyft, right? Think of Lyft collecting all that money as shares change hands and the stock price goes up. *Wrong*. Lyft raises funds in a primary market, but its shares trade in a secondary market. Those trades don't put money into Lyft's hands, but they do give important information to the firm's managers. Let's see why.

Primary markets are markets in which firms sell newly issued stocks and bonds to initial buyers. Businesses can raise funds in a primary financial market in two ways—by borrowing (selling bonds) or by selling shares of stock—which result in different types of claims on the borrowing firm's future income. Although you may hear about stock market fluctuations every day in news updates, bonds actually account for more of the funds raised by firms issuing new financial securities. The total value of bonds in the United States is typically about twice the value of stocks.

In *secondary markets*, stocks and bonds that have already been issued are sold by one investor to another. When Lyft sells shares to the public, it is turning to a primary market for new funds. (When a private company goes public by selling stock for the first time, the stock sale is called an *initial public offering* [*IPO*].) Once Lyft's shares are issued, investors trade them in the secondary market. Lyft does not receive any new funds when its shares are traded. The initial seller of a stock or bond raises funds from an investor only in the primary market. Secondary markets convey information to firms' managers and investors by determining the prices of stocks and bonds. For example, a major increase in Lyft's stock price conveys the market's optimism about the firm, and Lyft may decide to raise funds to expand. So, secondary markets are valuable sources of information for corporations that are considering raising funds.

Primary and secondary markets are both important, but they play different roles. As an investor, you principally trade stocks and bonds in a secondary market. If you become a corporate manager, you may help decide how to raise new funds to expand the firm where you work.

Your Turn: Test your understanding by doing related problem 2.9 at the end of this chapter.

The most widely followed stock market indexes are the three that appear on the first page of the *Wall Street Journal*'s website: the Dow Jones Industrial Average, the S&P 500, and the Nasdaq Composite Index. Although the Dow is an average of the prices of the stocks of just 30 large firms, including Coca-Cola, Microsoft, and Walt Disney, it is the most familiar index to many individual investors. The S&P 500 index includes the 30 stocks that are in the Dow as well as stocks issued by 470 other large companies, each of which has a market capitalization of at least $5 billion. Because these firms are so large, the total value of their stocks represents about 80 percent of the value of all publicly traded U.S. firms. The Nasdaq Composite Index includes the more than 3,500 stocks that are traded in the Nasdaq over-the-counter market. Some firms in the Nasdaq Composite Index, such as Apple and Microsoft, are also included in the Dow and in the S&P 500, but the Nasdaq includes stocks issued by many smaller technology firms that are not included in the other indexes.

There are two key points about index numbers, such as the stock market indexes, to keep in mind:

1. The numbers are not measured in dollars or any other units. Indexes are set equal to 100 in a particular year, called the *base year*. Because indexes are designed to show movements in a variable over time, the year chosen as the base year is not important.
2. The values of index numbers aren't meaningful by themselves. Instead, investors and firms focus on changes in the indexes. For instance, the value of the S&P 500 was 4099 in 2022. No one is particularly interested in that value by itself, but the fact that the S&P 500 decreased from 4273 in 2021 to 4099 in 2022 is interesting because it tells us that this measure of stock prices decreased by:

$$\left(\frac{4099 - 4273}{4273}\right) \times 100 = -4.1\%.$$

(For a review of how to calculate percentage increases, see the appendix to Chapter 1.) This decrease is in contrast with the long-run increase in stock prices, which has averaged about 11 percent per year.

Figure 8.3 shows monthly values from 1989 to 2022 in the S&P 500, the stock index that comes closest to reflecting general movements in stock prices. (The shaded areas represent months in which the U.S. economy was in a business cycle recession, when the production and profits of many firms were falling.)

As we've seen, ownership of a firm's stock represents a claim on the firm's profits. So, the larger the firm's profits are, the higher its stock price will be. When the overall economy is expanding, incomes, employment, and spending will all increase, as will corporate profits. When the economy is in a recession, incomes, employment, and spending will fall, as will corporate profits. Therefore, we would expect that stock prices typically will rise when the economy is expanding and fall when the economy is in recession. We see this pattern reflected in the S&P 500 index shown in Figure 8.3, with the index falling during each of the four recessions shown and typically rising during other periods.

Why Is It So Hard to Beat the Market?

We know that stock prices reflect the profitability of firms: Firms with the highest profits generally have the highest stock prices. So to earn the highest return on your investment in the stock market, should you only buy stock issued by the most profitable firms? Sounds reasonable, but, in fact, stock prices are difficult to predict because they are based less on the *current* profitability of firms than on their *expected* future profitability. After all, few investors would be willing to pay a high price for a stock that was profitable today but was expected to suffer large losses tomorrow.

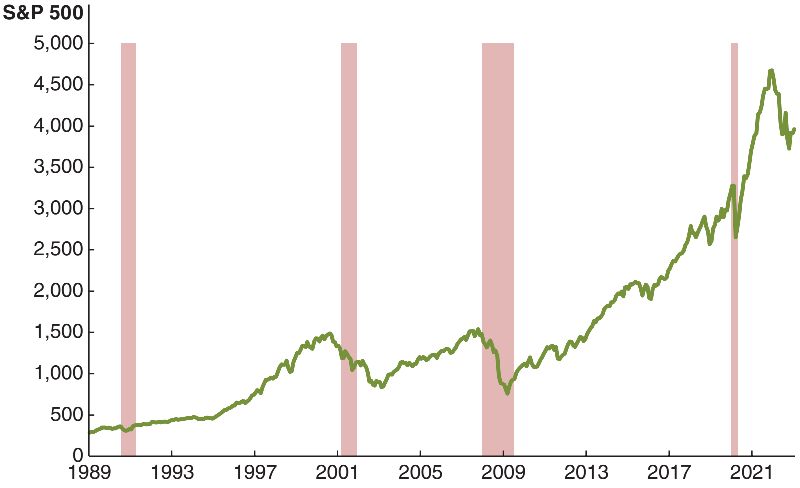


Figure 8.3

Movements in the S&P 500, 1989–2022

The performance of the U.S. stock market is often measured by market indexes, which are averages of stock prices. The three most important indexes are the Dow Jones Industrial Average, the S&P 500, and the Nasdaq Composite Index. The S&P 500 is composed of the stocks of the 500 largest companies, so it does the best job of reflecting general movements in stock prices. During the period from 1989 to 2020, the S&P 500 shows a regular pattern of typically rising when the U.S. economy is expanding and falling when the economy is in recession.

Many Wall Street investment professionals expend a great deal of effort gathering all possible information about the future profitability of firms, hoping to buy the stocks that are most likely to rise in the future. As a result of the actions of these professional investors, all of the information about a firm that is available on news and financial websites, cable TV business shows, and online discussion sites like X and Reddit is already reflected in the firm's stock price. For example, if at the end of a particular day, Tesla is selling for $185 per share, that price reflects all the information available about Tesla's future profitability. What might cause Tesla's stock price to change? *Only new information about its future profitability*. For example, if Tesla announces that its sales during the previous three months were much greater than investors had expected, its stock price will rise.

Even highly paid professional investors can't consistently predict stock prices. The managers of mutual funds and ETFs who frequently buy and sell stocks are rarely able to "beat the market" by earning a return higher than the increase in a stock market average, such as the S&P 500. One study found that, in a typical year, only one-third of mutual fund managers were able to earn their investors a higher return than a small investor could earn by investing in an *index mutual fund* that buys only the stocks in the S&P 500. Only 10 percent of mutual fund managers earned a higher return than an index fund for two consecutive years.

If you are starting your first full-time job, should you avoid the risk of investing in the stock market and keep your savings in a bank? If you intend to buy a car soon, you should keep the money you plan to use for a down payment in a bank where its value won't decline and the money is easy to withdraw. But if your first job allows you to save for retirement, perhaps by contributing to a 401(k) retirement account, you should consider investing in the stock market.

Risk The degree of uncertainty in the return on an asset.

Panel (a) of Table 8.2 shows the average annual returns of several broad categories of investments over the years from 1928 to 2022. In the table, "large" companies are those like Apple, General Motors, and Microsoft that are included in the S&P 500 stock index. Note that stocks earned much more than either long-term U.S. Treasury bonds, with maturities of 30 years, or short-term U.S. Treasury bills, with maturities of 1 year or less. But stocks are much riskier than bonds. Economists measure **risk** as the degree of uncertainty in the return on an asset. Because the prices of stocks fluctuate more than the prices of bonds, the return on stocks is more uncertain than the return on bonds, which is why stocks are considered riskier than bonds. Using a conventional measure of risk, large company stocks are about 50 percent more risky than U.S. Treasury bonds and five times riskier than U.S. Treasury bills.

Because investing in stocks is so risky, you wouldn't want to buy stocks with money that you might need sometime soon. Saving for retirement is a different story. Suppose that you save $100 per month beginning at age 22. Panel (b) of Table 8.2 uses plausible assumptions about future rates of return to show that in saving for retirement, investing

Table 8.2

Returns from Investing in Different Assets

Financial Asset	Average Annual Rate of Return
Large company stocks	11.5%
U.S. Treasury bonds	4.9
U.S. Treasury bills	3.3
Inflation rate	3.1

Source: Panel (a): Morning Star/Ibbotson, Federal Reserve Bank of St. Louis, FRED data bank, and Aswath Damodaran, "Historical Returns on Stocks, Bonds and Bills: 1928–2022," stern.nyu.edu, January 2023.

(a) Actual long-run returns, 1928–2022

	Bank CDs (assuming return of 1.5% per year)	U.S. Treasury bills (assuming return of 3.0% per year)	Stocks (assuming return of 11.0% per year)
At age 45	$33,076	$39,879	$125,710
At age 67	77,056	113,164	1,253,486
At age 67, after correcting for inflation of 3.0% per year	**$20,377**	**$29,925**	**$331,470**

(b) Hypothetical long-run returns from investing in different assets beginning at age 22

in stocks is likely to provide you with a much larger amount than is investing in safer assets such as certificates of deposit (CDs) in a bank or U.S. Treasury bills. When investing for the long run, it's important to know how much your money will buy in the future, taking into account increases in prices, as measured by the inflation rate. The last row of panel (b) corrects for the effects of an average inflation rate of 3.0 percent per year and shows that, at retirement, you can expect to be able to buy more than 10 times as much with the money you would receive from investing in stocks than with the money you would receive from investing in safer assets.

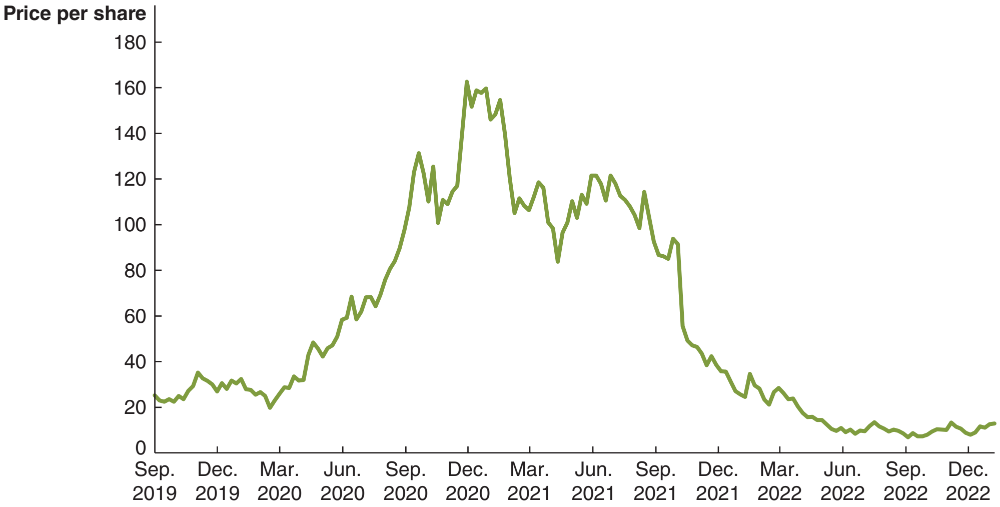
Apply the Concept

Why Is Peloton a $4 Billion Company if It Almost Always Loses Money?

The total value of all the outstanding shares of a firm's stock is called the firm's *market capitalization* or, in Wall Street jargon, *market cap*. In early 2023, Peloton Interactive, which makes internet-connected exercise equipment, had a market cap of $4.4 billion. Zillow Group, the online real estate firm, had a market cap of $10.4 billion. WeWork, which rents out co-working office space, had a market cap of $1.1 billion. In addition to having market caps of more than $1 billion, these three firms also had in common never having earned a profit as a public company over an entire year.

How can firms that don't earn a profit be worth more than $1 billion? As we've seen, the answer is that the price of a firm's stock depends not just on its current profitability but on expectations of its future profitability. Many investors believed that even though these firms were losing money, they would become profitable in the future, so in early 2023, they were willing to pay $16 for a share of Peloton, $45 for a share of Zillow, and $2 for a share of WeWork.

The key reason that stocks are a risky investment is that there is uncertainty about the future profitability of most firms and, therefore, uncertainty about whether the prices of their stock will rise or fall in the future. Although this uncertainty exists for the stock of any firm, it is particularly high for firms that have yet to earn a profit. Take the case of Peloton. As the following figure shows, the price of Peloton's stock has gone through wide swings since Peloton became a public company in September 2019. Those price swings represent changing opinions among investors about how profitable the company was likely to become.



In March 2020, the price of Peloton's stock was about the same as at the time of its IPO, $16. That all changed during the Covid–19 pandemic. Once it became clear that the severity of the pandemic would force many people to stay home for several months or longer, sales of Peloton's exercise equipment soared—and so did its stock price. Peloton's stock price peaked at $162 per share in December 2020. Peloton's innovation had been to sell exercycles and treadmills equipped with tablets that allow users to connect with instructors conducting online classes. At that time, John Foley, Peloton's cofounder and CEO, and the other top managers at Peloton had a question to answer: Did the surge in orders for their equipment and online classes represent a permanent increase in demand, or was the increase a result only of the unusually large number of people who were staying home during the pandemic and whose normal exercise routines had been disrupted by the closure of many private gyms?

Foley decided that the increase in demand was likely to be sustained even after the pandemic was over. Peloton elected to expand its capacity by building a new $400 million factory in Ohio. The firm's managers argued that there had been a permanent change in the desire of people to exercise at home and that their bundling equipment with a subscription to online workout classes gave them an advantage over other firms selling only exercise equipment. Foley was quoted in the *Wall Street Journal* as saying, "We feel like there's such a massive opportunity that we need to invest heavily in the supply chain for years and years to maintain it. When you say 'normalize coming out of Covid,' we don't see that." As it turned out, however, Peloton's managers had miscalculated.

By mid-2022, Peloton's sales of equipment had fallen by 50 percent from a year earlier, it had to sell the Ohio factory (without ever having used it), and it was laying off workers and cutting prices. Foley was replaced as CEO by Barry McCarthy, who had previously worked at Netflix and Spotify, the streaming music service. In the spring of 2023, although Peloton was still suffering losses, McCarthy and the firm's managers took several steps to improve sales. They began for the first time selling their equipment through third parties, like Amazon and Dick's Sporting Goods. Peloton's equipment remains more expensive than the equipment sold by competitors even after Peloton's price cuts. To overcome the reluctance of customers to pay the high prices at the time of purchase, Peloton began allowing buyers to pay a monthly fee for both the equipment and the online workouts, with the option to cancel at any time and return the equipment.

It was unclear whether these moves would be sufficient to make Peloton consistently profitable in the future. But enough investors expected the firm to become profitable to increase the demand for its shares, raising the price per share from a low of $7 in the fall of 2022 to more than $17 per share in early 2023. Peloton's experience provides a dramatic example of how changing investor expectations of a firm's future profitability can affect its stock price.

Your Turn: Test your understanding by doing related problem 2.11 at the end of this chapter.

Solved Problem 8.2

Why Does Warren Buffett Like Mutual Funds?

For decades, every fund manager would buy the individual stocks he or she believed would have the largest price increases in the future. In 1976, the late John Bogle of the Vanguard Group began selling the first index mutual fund available to individual investors. He took a unique new approach: He would buy all the stocks included in the S&P 500 without attempting to predict whether any individual stock might do better or worse than average. Warren Buffett is considered one of the greatest investors who has ever lived. His ability to predict which firms' stocks are likely to rise in price helped make him one of the richest people in the world. Yet Buffett was quoted as saying that by introducing the index mutual fund, Bogle "did more for American investors . . . than any individual I've known." Is it likely that anyone investing mostly in index mutual funds will become as wealthy as Buffett? Why then did Buffett have such high praise for Bogle?

Solving the Problem

Step 1: Review the chapter material. This problem is about investing in the stock market, so you may want to review the section "Why Is It So Hard to Beat the Market?"

Step 2: Answer the first question by explaining whether investing in index mutual funds is a way to become as wealthy as Warren Buffett. Most investors who have become wealthy have done so by making large investments in just a few firms. Index mutual funds typically hold all of the stocks in a stock market average like the S&P 500, so even if one or two of the stocks do extremely well, the total investment return from the fund will be held back by the smaller increases (or losses) in the other stocks in the fund. By investing in index mutual funds, you can accumulate significant amounts to pay for a house, a college education, or retirement. Many people who have earned only middle-class incomes have accumulated a million dollars or more at retirement age by investing in index mutual funds. But no one is known to have become fabulously wealthy with this approach to saving.

Step 3: Answer the second question by explaining why Warren Buffett would praise John Bogle for introducing the index mutual fund, even though investors are unlikely to become wealthy buying these funds. Mutual funds give individual investors a low-cost way to diversify. Although it's possible to earn a high return investing in the stocks of individual firms, it's also easy for a small investor to lose all of his or her money if those firms run into financial problems. As Buffett put it in one of his annual letters to investors in his company, Berkshire Hathaway: "Active investment management by professionals—in aggregate—[will] over a period of years underperform the returns achieved by rank amateurs who simply [sit] still . . . [by investing] in an unmanaged low-cost index fund."

Extra Credit: Warren Buffett may have become a billionaire by being better than other investors at predicting the future profits of the firms he invests in. Or he may have become a billionaire because he was lucky that the firms he invested in did particularly well—in which case he may not be better at forecasting the future profitability of firms than are other investors. Given that nearly all other equally intelligent and hard-working professional investors have been unable to consistently "beat the market" by earning higher returns than those earned by the typical low-cost, well-diversified mutual fund, it is impossible to know with certainty the true reasons for Buffett's success.

Your Turn: For more practice, do related problem 2.13 at the end of this chapter.

8.3 Using Financial Statements to Evaluate a Corporation

LEARNING OBJECTIVE: Describe the information corporations include in their financial statements.

To raise funds, a firm's managers must persuade potential lenders or investors that the firm will be profitable. Before a firm can sell new issues of stocks or bonds, it must first provide investors and financial regulators with information about its finances. To borrow from a bank, a firm must also provide the bank with financial information.

The Securities and Exchange Commission (SEC) requires publicly owned firms to report their performance in financial statements prepared using standard accounting methods, often referred to as *generally accepted accounting principles*. Such disclosure reduces the cost to investors of gathering information about firms, but it doesn't eliminate these costs—for two reasons. First, some firms may be too young to have much information for potential investors to evaluate. Second, managers may try to present the required information in the most favorable way so that investors will overvalue their securities.

Private firms also collect information on business borrowers and sell the information to lenders and investors. If the information-gathering firms do a good job, lenders and investors purchasing the information will be better able to judge the quality of borrowing firms. Some firms—including Moody's Investors Service, Standard & Poor's, Value Line, and Dun & Bradstreet—collect information from businesses and sell it to subscribers. Buyers include individual investors, libraries, and financial intermediaries. You can find some of these publications through online information services.

What kind of information do investors and firm managers need? A firm must answer three basic questions: What to produce? How to produce it? What price to charge? To answer these questions, a firm's managers need two pieces of information: The first is the firm's revenues and costs, and the second is the value of the property and other assets the firm owns and the firm's debts, or other **liabilities**, that it owes to households and other firms. Potential investors in the firm also need this information to decide whether to buy the firm's stocks or bonds. The information can be found in the firm's *financial statements,* principally its income statement and balance sheet, which we discuss next.

Liability Anything owed by a person or a firm.

The Income Statement

A firm's **income statement** shows its revenues, costs, and profit over a period of time. Corporations issue annual income statements, although the 12-month *fiscal year* covered may be different from the calendar year to better represent the seasonal pattern of the business.

Income statement A financial statement that shows a firm's revenues, costs, and profit over a period of time.

Accounting Profit An income statement shows a firm's revenue, costs, and profit for the firm's fiscal year. To determine profitability, the income statement starts with the firm's revenue and subtracts its operating expenses and taxes paid. The remainder, *net income,* is the **accounting profit** of the firm.

Accounting profit A firm's net income, measured as revenue minus operating expenses and taxes paid.

Economic Profit Accounting profit provides information on a firm's current net income, measured according to accepted accounting standards. Accounting profit is not, however, the ideal measure of a firm's profit because it doesn't include some of the firm's costs. *Economic profit* provides a better indication than accounting profit of how successful a firm is because economic profit is calculated using all of a firm's costs. Firms making an economic profit will remain in business and may even expand. Firms making an *economic loss* are unlikely to remain in business in the long run.

To understand how economic profit is calculated, remember that economists always measure cost as *opportunity cost*. The **opportunity cost** of any activity is the highest-valued alternative that must be given up to engage in that activity. Costs are either *explicit* or *implicit*:

Opportunity cost The highest-valued alternative that must be given up to engage in an activity.

- When a firm spends money, it incurs an **explicit cost**. For example, firms incur an explicit labor cost when they pay wages to employees. Firms have many other explicit costs as well, such as the cost of the electricity used to light their buildings or the costs of advertising or insurance.
- If a firm incurs an opportunity cost but does not spend money, it incurs an **implicit cost**. The most important implicit cost for most firms is the opportunity cost to investors (including the firm's owners) of the funds they have invested in the firm.

Explicit cost A cost that involves spending money.

Implicit cost A nonmonetary opportunity cost.

Economists use the term *normal rate of return* to refer to the minimum amount that investors must earn on the funds they invest in a firm, expressed as a percentage of the amount invested. If a firm fails to provide investors with at least a normal rate of return, it will not be able to remain in business over the long run because investors will not continue to invest their funds in the firm. For example, in 2019, Mark Tritton became CEO of home goods seller Bed Bath & Beyond. The firm was operating 1,500 stores in the United States, but some shareholders were concerned that they weren't receiving a sufficient return on their investments in the company. Tritton reorganized the stores to reduce the number of different products available for sale and replaced some name brand goods with so-called private-label brands that Bed Bath & Beyond produced itself. Unfortunately, Tritton's strategy failed, and the firm, which had been profitable in 2018, suffered losses each year between 2019 and 2022. The losses totaled almost $1.5 billion. In June 2022, the firm's board of directors replaced Tritton with Sue Grove, who had been serving on the board. In early 2023, many investors expected the firm to eventually declare bankruptcy, and as a result, the price of its stock dropped from above $80 per share to less than $3 per share. In April 2023, the firm announced that it was closing all its stores, and that its remaining assets would be sold off. The return (in dollars) that investors require to continue investing in a firm is a true cost to the firm and should be subtracted from the firm's revenues to calculate its profit.

The rate of return that investors require to continue investing in a firm varies from firm to firm. If the investment is particularly risky—as would be the case with, for instance, a biotechnology startup—investors may require a high rate of return to compensate them for the risk. Investors in firms in more established industries, such as electric utilities, may require lower rates of return. The exact rate of return investors require to invest in any particular firm is difficult to calculate, which also makes it difficult for an accountant to include the return as a cost on an income statement. Firms have other implicit costs besides the return investors require, that can also be difficult to calculate. As a result, the rules of accounting generally require that only explicit costs be included in the firm's financial records. *Economic costs* include both explicit costs *and* implicit costs. **Economic profit** is equal to a firm's revenues minus its economic costs. Because accounting profit excludes some implicit costs, it is larger than economic profit.

Economic profit A firm's revenues minus all of its implicit and explicit costs.

The Balance Sheet

A firm's **balance sheet** shows its financial position on a particular day, usually the end of a quarter or year. Recall that an *asset* is anything of value that a firm owns, and a *liability* is a debt or an obligation owed by a firm. Subtracting the value of a firm's liabilities from the value of its assets leaves its *net worth*. We can think of the net worth as what the firm's owners would be left with if the firm were closed, its assets were sold, and its liabilities were paid off. Investors can determine a firm's net worth by inspecting its balance sheet.

Balance sheet A financial statement that sums up a firm's financial position on a particular day, usually the end of a quarter or year.

Problems in Corporate Governance

Accurate and easy-to-understand financial statements help a firm's managers make decisions and provide information to investors who are considering buying the firm's stock or bonds. Firms disclose financial statements in periodic filings to the federal government and in *annual reports* to shareholders. An investor is more likely to buy a firm's stock if the firm's income statement shows a large after-tax profit and if its balance sheet shows a large net worth. The top management of a firm has at least two reasons to attract investors and keep the firm's stock price high.

Top managers have an incentive to maximize the profit reported on the income statement and the net worth reported on the balance sheet. If top managers make good decisions, the firm's profit will be high, and the firm's assets will be large relative to its liabilities. At some firms, though, top managers have inflated profits and concealed liabilities that should have been listed on their balance sheets. Managers also sometimes take on more risk than they disclose to investors.

To guard against actions that top managers may take that are contrary to the interests of their shareholders, Congress passed the *Sarbanes-Oxley Act* in 2002. The act requires (1) CEOs to personally certify the accuracy of financial statements and (2) financial analysts and auditors to disclose whether any conflicts of interest might exist that would limit their independence in evaluating a firm's financial condition. On balance, most observers believe that the Sarbanes-Oxley Act has increased confidence in the U.S. corporate governance system.

During 2007–2009, problems at some financial firms again raised questions about whether corporations were adequately disclosing information to investors. When someone buys a house, the buyer typically borrows the money by taking out a mortgage loan from a bank or another financial institution. The house is pledged as collateral for the loan, meaning that the bank can take possession of the house and sell it if the borrower defaults by failing to make the payments on the loan. In a process called *securitization*, banks and other financial firms bundle many mortgages together into *mortgage-backed securities*, which are very similar to bonds in that the investor who buys one receives regular interest payments. Owners of mortgage-backed securities receive payments that come from the payments homeowners are making on the original mortgage loans.

During the financial crisis of 2007–2009, some investors complained that they weren't aware of the riskiness of some of the assets—particularly mortgage-backed securities—on the balance sheets of financial firms. Some observers believed that the managers of many financial firms had intentionally misled investors about the riskiness of these assets. Others argued that the managers themselves had not understood how risky the assets were. As the financial crisis passed, in 2010, Congress overhauled the regulation of the financial system with the passage of the **Wall Street Reform and Consumer Protection Act**, referred to as the **Dodd-Frank Act**. Among its provisions, the act (1) created the Consumer Financial Protection Bureau, housed in the Federal Reserve—the central bank of the United States—to write rules intended to protect consumers in their borrowing and investing activities, and (2) established the Financial Stability Oversight Council, which includes representatives from all the major federal financial regulatory bodies, including the SEC and the Federal Reserve. The council is intended to identify and act on risks to the financial system. Economists are divided in their opinions about whether the Dodd-Frank Act will significantly reduce the risk of future financial crises.

Wall Street Reform and Consumer Protection Act (Dodd-Frank Act) Legislation passed during 2010 that was intended to reform regulation of the financial system.

Apply the Concept

Should Investors Worry about Corporate Governance at Some Startups?

lyft
Nasdaq
LYFT
Nasdaq Listed

Ringo H.W. Chiu/AP Images

Lyft's cofounders, Logan Green and John Zimmer, own 49 percent of the voting shares in the company.

When the ride-hailing firm Lyft began selling stock in an *initial public offering* (*IPO*) in 2019, some investors were concerned about potential corporate governance issues at the company. In Lyft's IPO, investors buying newly issued shares would not have the voting rights that shareholders typically have. The company has two classes of stock (a practice that was not allowed for stocks listed on the New York Stock Exchange until the 1980s):

Class of Stock	Voting Rights	Relevance to Lyft's IPO
Class A	1 vote per share	The IPO consisted only of Class A shares, meaning that investors who bought them would have 1 vote per share in electing members of the board of directors.
Class B	20 votes per share	Class B shares were held only by the two founders.

Because of the quantity of each class of stock issued, cofounders Logan Green and John Zimmer own shares that give them 49 percent of the votes in electing the board of directors, even though those shares give them ownership of only 5 percent of the total value of the firm. They have much more control than is typical for top managers at a public company.

Google, Facebook, and Snap have also issued two or more classes of shares, with the intention of keeping control of the firm in the hands of the founders. A financial columnist at the *New York Times* argued that when these firms issue so-called super-voting shares, they undermine "the system of accountability that has long been a pillar of public stock markets."

But does Lyft's governance structure matter? Many investors apparently don't think so because on the day of its IPO, Lyft sold 30.8 million Class A shares, which raised $2.3 billion for the firm. Other investors, though—particularly some pension funds and other *institutional investors*—were unwilling to invest in Lyft because of the firm's governance structure. They worried that with only a limited ability to elect outside directors, there would be little chance to bring in new top managers if Green and Zimmer failed to make the firm profitable. Similarly, it would be difficult for the directors to sell the firm to outside investors even if doing so would likely increase the value of the Class A shares. Glenn Kelman, the CEO of Redfin, an online real estate brokerage, was critical of the structure at Lyft and other high-tech firms and said, "The feeling that I serve at the pleasure of the board, that it is a privilege to work at Redfin, is fundamental to this company and the best of business culture."

Green and Zimmer, along with the founders of other technology firms, argue that they have good reason to limit the voting rights of shareholders. They believe that shareholders with voting rights can push top management into making decisions that might help boost profit in the short run but that will be bad for the firm—and its shareholders—in the long term. As former Securities and Exchange Commissioner Robert J. Jackson, Jr., put it, "The structure can allow entrepreneurs to build for the long term—and even transform entire industries—without being subject to short-term pressure." But Jackson also noted that seven years after an IPO, the stock prices of companies that issue nonvoting shares perform worse than the stock prices of companies that do not issue nonvoting shares. As we discussed in the chapter opener, when Elon Musk decided to buy X and take it private, he did so, in part, because as the owner of a private firm, he would be free to implement changes that he believed would make the firm more profitable without having to worry about whether shareholders would agree with him.

In 2023, many investors seemed to believe that Lyft's future success would depend more on its ability to recover from the decline in ridership and shortage of drivers it had experienced since the beginning of the pandemic than on its corporate structure.

Your Turn: Test your understanding by doing related problem 3.11 at the end of this chapter.

Continued from chapter opener

Economics in Your Life & Career

Is an Ad-Free Version of X Likely to Be More Profitable for Elon Musk?

At the beginning of the chapter, we asked you to suppose that Elon Musk had hired you to work as an economist at X. As part of his strategy to make X more profitable, Musk had begun offering a service that, among other things, would allow purchasers to see only half the usual number of ads on the app in exchange for paying a fee of $8 to $11 per month. We asked you to consider the factors you would need to take into account in evaluating whether that service was likely to make X significantly more profitable and whether Musk should begin offering a higher-priced ad-free service.

To evaluate Musk's strategy, you would need to gather some important information. Effectively, his strategy is trading off the lower revenue from the reduced rates he will be able to charge advertisers on X—because fewer people will be viewing the ads—against the increase in revenue from people paying to see 50 percent fewer ads or no ads at all if that proposed service is introduced. The information on how much advertising rates would need to be reduced may already have been gathered by X because the site has been selling advertising for years. How many users of the app would be willing to pay to see 50 percent fewer ads will be based on how many users are currently paying for that service. Whether users would pay a higher fee to see zero ads depends largely on how annoyed the typical app user is by targeted ads. Many people are annoyed by targeted ads, but some people actually find the ads useful and would prefer to see them rather than pay any fee.

You can help Musk make his decision by letting him know that there is evidence that his strategy may not significantly increase X's profit because we know that people are reluctant to pay anything to use an app. Some free apps are downloaded millions of times, while very similar apps that charge a small fee have significantly fewer downloads. In a given year, only about one-third of smartphone or tablet owners will pay for any apps. App developers have mostly adopted the business model of allowing their apps to be downloaded and used for free while trying to still earn money from users. For instance, the popular games *Clash of Clans* and *Candy Crush Saga* can be downloaded and played for free. The developers earn a profit from people who pay to play the game faster, get extra turns, or otherwise receive benefits not available to those who play for free.

That approach, though, is difficult for Musk to adopt. To some extent, he has already attempted to do so by offering the current paid service. In addition to seeing fewer ads, someone who purchases that service receives some other benefits, such as being able to edit tweets and upload high-resolution videos. It's unclear whether users will value these benefits as much as people who play game apps value the enhancements to game play that many are willing pay for.

Conclusion

In a market system, firms make independent decisions about which goods and services to produce, how to produce them, and what prices to charge. In modern high-income countries, such as the United States, large corporations account for a majority of the sales and profits earned by firms. Generally, the managers of these corporations do a good job of representing the interests of stockholders while providing the goods and services demanded by consumers. But sometimes the principal–agent problem can become severe. Economists debate the costs and benefits of regulations proposed to address this problem.

CHAPTER SUMMARY AND PROBLEMS

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8.1 Types of Firms

LEARNING OBJECTIVE: Categorize the major types of firms in the United States.

Summary

There are three types of firms: A **sole proprietorship** is a firm owned by a single individual and not organized as a corporation; a **partnership** is a firm owned jointly by two or more persons and not organized as a corporation; and a **corporation** is a legal form of business that provides its owners with limited liability. An **asset** is anything of value owned by a person or a firm. The owners of sole proprietorships and partnerships have unlimited liability, which means there is no legal distinction between the personal assets of the owners of the business and the assets of the business. The owners of corporations have **limited liability**, which means they can never lose more than their investment in the firm. Although only 17 percent of firms are corporations, they account for the majority of revenue and profits earned by all firms. **Corporate governance** refers to the way in which a corporation is structured and the effect the structure has on the firm's behavior. Most corporations have a similar management structure: The shareholders elect a board of directors that appoints the corporation's top managers, such as the chief executive officer (CEO). Because top managers often do not own a large fraction of the stock in the corporation, large corporations have a **separation of ownership from control**. When top managers have less incentive to increase the corporation's profits than to increase their own salaries and their own enjoyment, corporations can suffer from the **principal–agent problem**. This problem exists when the principals—in this case, the shareholders of the corporation—have difficulty getting the agent—the corporation's top management—to carry out their wishes.

Review Questions

1.1 What are the three major types of firms in the United States? Briefly discuss the most important characteristics of each type.

1.2 What is limited liability? Why does the government grant limited liability to the owners of corporations? Why is limited liability more important for firms trying to raise funds from a large number of investors than for firms trying to raise funds from a small number of investors?

1.3 What does it mean to describe large corporations as having a separation of ownership from control? How is the separation of ownership from control related to the principal–agent problem?

Problems and Applications

1.4 Suppose that shortly after graduating from college, you decide to start your own business. Will you be likely to organize the business as a sole proprietorship, a partnership, or a corporation? Explain your reasoning.

1.5 An article discussing why the Connecticut state legislature passed a general incorporation law in 1837 observed that prior to the passage of the law, investors were afraid that large businesses "were not a safe bet for their money." Briefly explain the author's reasoning.

1.6 Evaluate the following argument:

> I would like to invest in the stock market, but I think that buying shares of stock in a corporation is too risky. Suppose I buy $10,000 of Lyft stock, and the company ends up going bankrupt. Because as a stockholder I'm part owner of the company, I might be responsible for paying hundreds of thousands of dollars of the company's debts.

1.7 In a study of general incorporation laws in the United States, Eric Hilt of Wellesley College noted, "Prior to the adoption of a general statute, a business could only incorporate if the state passed a special law granting it a corporate charter." What are the advantages of general incorporation laws over the previous system? Are there any disadvantages? Briefly explain.

1.8 [Related to the **Apply the Concept "What Explains the Recent Surge in New Businesses Being Started?"**] Jay Shambaugh and colleagues at the Brookings Institution argued:

> In recent years it has become clear that young firms—and not necessarily small firms, as

is commonly supposed—are the engine of employment and productivity growth in the United States. As they introduce new technologies and business methods, new firms contribute substantially to productivity growth.

a. Why might new firms be more likely than older firms to introduce new technologies and business methods?

b. Assuming that these economists are correct about the importance of new firms in introducing productivity-enhancing innovations, what are the implications for the future of the U.S. economy of the trend in the formation of new businesses since the Covid–19 pandemic?

1.9 **[Related to the Apply the Concept "What Explains the Recent Surge in New Businesses Being Started?"]** Minnesota Senator Amy Klobuchar was a candidate for the 2020 Democratic nomination for president. In an opinion column written with Senator Mike Lee of Utah, she argued, "There is evidence that [occupational] licensing requirements raise the price of goods and services, restrict employment opportunities, and make it more difficult for workers to take their skills across state lines." She also wrote that "licensing requirements should address only legitimate public health and safety requirements to ease burdens on workers."

a. If Senator Klobuchar's suggested restrictions on occupational licensing were followed, what would be the likely effect on the rate at which small businesses are formed?

b. Given your answer to part (a), why did state and local governments pass such licensing requirements in the first place?

1.10 **[Related to the Apply the Concept "What Explains the Recent Surge in New Businesses Being Started?"]** In 2022 and 2023, states including Pennsylvania, Utah, and Maryland removed their requirement that those applying for some state government jobs have college degrees. In the case of Pennsylvania, 92 percent of state jobs no longer require a college degree. If dropping the requirement to hold a college degree when applying for a government job spreads to most states and to the federal government, what effect would this change likely have on the rate at which new businesses are formed? Briefly explain.

1.11 In 2019, 181 CEOs signed a statement pledging a commitment to "deliver value to all stakeholders." According to an opinion column in the *Wall Street Journal*, investors have generally believed "that executives [are] the 'agents' of . . . shareholders . . . [and] their single aim should be to make as much money as possible within the bounds of the law."

a. Identify a corporation's stakeholders. How are a corporation's stakeholders different from its shareholders?

b. Some investors believe that, instead of maximizing profits, corporations should pursue policies that promote environmental, social, and governance (ESG) issues. But the compensation of most CEOs is tied to profitability of their firm rather than to their success in promoting ESG issues. Why would it be more difficult to tie a CEO's compensation to a corporation's performance on ESG issues rather than to the corporation's profitability?

1.12 Salespeople, whether selling life insurance, automobiles, or pharmaceuticals, typically get paid on commission instead of a straight hourly wage or fixed weekly salary.

a. How does paying a commission help solve the principal–agent problem between the owners of a business and their salespeople?

b. What are the advantages and disadvantages from the viewpoint of a salesperson in being paid on commission rather than receiving a fixed amount of weekly salary?

1.13 Private equity firms, such as Blackstone and Kohlberg Kravis Roberts & Co., search for firms where the managers appear not to be maximizing profits. A private equity firm can buy stock in such a firm and have its employees elected to the firm's board of directors and may even acquire control of the targeted firm and replace the top management. Does the existence of private equity firms reduce any problems in corporate governance? Briefly explain.

1.14 **[Related to the Apply the Concept "Multinational Corporations: Why Would Elon Musk Build Factories in China and Germany?"]** An article in the *Wall Street Journal* in early 2023 discussed Tesla's decision to cut the prices of the electric vehicles it sells in China. According to the article, "The company said it is responding to the Chinese government's calls to boost the economy and encourage consumption." Because the vehicles Tesla sells in China are produced in the firm's Shanghai factory, its business decisions in China can be affected by the policies of the Chinese government. Why doesn't Tesla avoid this problem by producing in the United States the vehicles it sells in China?

8.2 How Firms Raise Funds

LEARNING OBJECTIVE: Explain how firms raise the funds they need to operate and expand.

Summary

Firms rely on retained earnings—which are profits kept by the firm and not paid out to its owners—or on using the savings of households for the funds they need to operate and expand. With **direct finance**, the savings of households flow directly to businesses when investors buy **stocks** and **bonds** in financial markets. With **indirect finance**, savings flow indirectly to businesses when households deposit money in savings and checking accounts in banks and the banks lend those funds to businesses. Federal, state, and local governments also sell bonds in financial markets, and households also borrow funds from banks. When a firm sells a bond, it is borrowing money from the buyer of the bond. Firms make **coupon payments** to buyers of bonds. The **interest rate** is the cost of borrowing funds, usually expressed as a percentage of the amount borrowed. When a firm sells stock, it is selling part ownership of the firm to the buyer of the stock. **Dividends** are payments by a corporation to its shareholders. The original purchasers of stocks and bonds may resell them in stock and bond markets, such as the New York Stock Exchange. The performance of the U.S. stock market is often measured using stock market indexes. The three most widely followed stock indexes are the Dow Jones Industrial Average, the S&P 500, and the Nasdaq Composite Index. **Risk** is the degree of uncertainty in the return on an asset.

Review Questions

2.1 What is the difference between direct finance and indirect finance? If you borrow money from a bank to buy a new car, are you using direct finance or indirect finance?

2.2 Why is a bond considered to be a loan, but a share of stock is not? Why do corporations issue both bonds and shares of stock?

2.3 How do the stock and bond markets provide information to businesses? Why do stock and bond prices change over time?

Problems and Applications

2.4 Suppose that a firm in which you have invested is losing money. Would you rather own the firm's stock or the firm's bonds? Briefly explain.

2.5 **[Related to the Chapter Opener]** Tesla Motors was founded in 2003 and remained a private firm until 2010, when Elon Musk took it public. Were the shares of stock issued as a result of Tesla's initial public offering (IPO) sold in a primary market or a secondary market? Was the IPO an example of direct finance or indirect finance?

2.6 **[Related to the Apply the Concept "The Rating Game: Are Federal, State, or City Governments Likely to Default on Their Bonds?"]** Coinbase operates an exchange on which investors can buy and sell cryptocurrencies like Bitcoin and Ethereum. According to an article on yahoo.com in January 2023, Standard & Poor's (S&P) cut its rating on Coinbase's bonds from BB to BB−.

- **a.** What is S&P's top bond rating? Under what circumstances would S&P or one of the other bond-rating agencies be likely to cut the rating on a firm's bonds?
- **b.** How is this cut in rating likely to affect the interest rate that Coinbase will have to pay when it sells new bonds? Briefly explain.

2.7 **[Related to the Apply the Concept "The Rating Game: Are Federal, State, or City Governments Likely to Default on Their Bonds?"]** Investors use the bond ratings from Moody's, S&P, and Fitch to determine which bonds they will buy and the prices they are willing to pay for them. The rating services charge the firms and governments that issue bonds, rather than investors, for their services. Critics argue that the rating agencies may give higher ratings than are justified in order to continue to sell their services to bond-issuing firms. To avoid this impression, why don't Moody's, S&P, and Fitch sell their services directly to investors?

2.8 Briefly explain what effect the following events would likely have on the price of Amazon's stock.

- **a.** Walmart.com announces that all purchases on its website will receive free shipping.
- **b.** The corporate income tax is abolished.
- **c.** Amazon's board of directors becomes dominated by close friends and relatives of its top management.
- **d.** The price of wireless internet connections in developing countries unexpectedly drops, and more and more people worldwide use the internet.
- **e.** Amazon announces that it earned a profit of $10 billion during the previous three months, but investors had anticipated that Amazon would earn a profit of $15 billion during that period.

2.9 **[Related to the Don't Let This Happen to You]** Briefly explain whether you agree with the following statement: "The total value of the shares of Microsoft stock traded on the Nasdaq last week was $895 billion, so the firm actually received much more revenue from stock sales than from selling software."

2.10 A columnist in the *New York Times* observed that "the entire point of investing in stocks is that you get greater long-term expected returns in exchange for tolerating bigger ups and downs."

- **a.** Why did the columnist refer to long-term *expected* returns? Isn't there a way to determine with certainty what the return will be on money invested in the stock market? Briefly explain.
- **b.** Would it be a good idea to invest in the stock market money that you will need in two years as a down payment on a car? Briefly explain.

2.11 **[Related to the Apply the Concept "Why Is Peloton a $4 Billion Company If It Almost Aways Loses Money?"]** An article on barrons.com had the headline "Peloton Stock Sank Again. That Doesn't Make It Cheap." In December 2020, Peloton's stock had a price of more than $160 per share. When the barrons.com article was written in August 2022, the price had fallen to $11 per share. The article quoted an investment analyst as observing: "For a company with no profits and declining revenues, it seems hard to call that 'cheap' unless you see a material inflection in future subscribers."

- **a.** What makes a stock "cheap"? What makes a stock "expensive?" Is it all just a matter of the stock's price? If so, why did the investor analyst argue that Peloton's stock wasn't cheap at a price that was more than 90 percent below the stock's highest price?
- **b.** Would every investor be likely to agree with the analyst's opinion that Peloton's stock was still expensive at $11 per share? If so, why were any investors buying the stock at that price?

2.12 **[Related to the Economics in Your Life & Career]** An article in the *Wall Street Journal* observed that Elon Musk "has said he wants [X], which hasn't booked an annual profit since 2019, to rely less on advertising and more on alternative ways of making money, such as paid subscriptions." What are the advantages of X relying more on paid subscriptions than on advertising? Are there any disadvantages? Briefly explain.

2.13 **[Related to Solved Problem 8.2]** In a letter to his company's stockholders, Warren Buffett offered the following opinion: "Most investors, of course, have not made the study of business prospects a priority in their lives. . . . I have good news for these non-professionals: The typical investor doesn't need this skill." Briefly explain Buffett's reasoning.

8.3 Using Financial Statements to Evaluate a Corporation

LEARNING OBJECTIVE: Describe the information corporations include in their financial statements.

Summary

A firm's **income statement** shows its revenues, costs, and profit over a period of time. A firm's **balance sheet** shows its financial position on a particular day, usually the end of a quarter or year. A balance sheet records a firm's assets and liabilities. A **liability** is anything owed by a person or a firm. Firms report their **accounting profit** on their income statements. Accounting profit does not always include all of a firm's **opportunity costs**. An **explicit cost** is a cost that involves spending money. An **implicit cost** is a nonmonetary opportunity cost. Because accounting profit excludes some implicit costs, it is larger than **economic profit**. In 2002, Congress passed the *Sarbanes-Oxley Act* to address the problem of some corporations issuing misleading financial statements. Following the financial crisis of 2007–2009, Congress passed the **Wall Street Reform and Consumer Protection Act (Dodd-Frank Act)**, partly to address issues of corporate governance at some financial firms.

Review Questions

3.1 What is the difference between a firm's assets and its liabilities? Give an example of an asset and an example of a liability.

3.2 What is the difference between a firm's balance sheet and its income statement?

3.3 Distinguish between a firm's explicit costs and its implicit costs and between a firm's accounting profit and its economic profit.

3.4 Would a business be expected to survive in the long run if it earned a positive accounting profit but a negative economic profit? Briefly explain.

3.5 What is corporate governance? In whose interest should corporations be governed? Briefly explain.

Problems and Applications

3.6 Paolo currently has $100,000 invested in bonds that earn him 4 percent interest per year. He wants to open a pizza restaurant and is considering either selling the bonds and using the $100,000 to start his restaurant or borrowing $100,000 from a bank, which would charge him an annual interest rate of 6 percent. He finally decides to sell the bonds and not take out the bank loan. He reasons: "Because I already have the $100,000 invested in the bonds, I don't have to pay anything to use the money. If I take out the bank loan, I have to pay interest, so my costs of producing pizza will be higher if I take out the loan than if I sell the bonds." Evaluate Paolo's reasoning.

3.7 Paolo and Alfredo are twins who both want to open pizza restaurants. Their parents have always liked Alfredo best, and they buy two pizza ovens and give both to him. Unfortunately, Paolo must buy his own pizza ovens. Does Alfredo have a lower cost of producing pizza than Paolo does because Alfredo received his pizza ovens as a gift, while Paolo had to pay for his? Briefly explain.

3.8 Dane decides to give up a job earning $200,000 per year as a corporate lawyer and converts the duplex that he owns into a UFO museum. (He had been renting out the duplex for $20,000 a year.) His explicit costs are $75,000 per year paid to his assistants and $10,000 per year for utilities. Fans flock to the museum to see his collection of extraterrestrial paraphernalia, which he could easily sell on eBay for $1 million. Over the course of the year, the museum brings in revenues of $200,000.

a. How much is Dane's accounting profit for the year?

b. Is Dane earning an economic profit? Explain.

3.9 According to an opinion column in the *Wall Street Journal*, "Directors need to be held more accountable when they fail to set the proper tone at the top, and right now there is almost no consequence for most governance failures."

a. What is the key principal–agent problem that exists in some corporations?

b. To whom are members of the board of directors responsible?

c. What does the columnist mean by "governance failures"? Who is failing? Why might these failures be happening?

3.10 A firm sometimes has to issue a "financial restatement" when its managers discover errors in the income statement it had previously issued. As you might guess, the errors are likely to have caused the firm's profit to appear higher than it actually was. According to an article on barrons.com, the federal government's Securities and Exchange Commission (SEC) has been considering "requiring public companies to claw back improperly awarded incentive compensation in the event of certain financial restatements."

a. Why might a firm's management have reasons to issue an income statement that overstates a firm's profit?

b. What does the SEC mean by requiring a company to "claw back" compensation? Shouldn't a firm's board of directors want to claw back improperly awarded compensation without being required to do so? Briefly explain.

3.11 [Related to the **Apply the Concept "Should Investors Worry about Corporate Governance at Some Startups?"**] In discussing corporate structures like Lyft's, where there are two classes of stock, and the founders own most of the class with the most voting power, SEC Commissioner Robert J. Jackson, Jr., argued that there is reason to think that, at least for a defined period of time early in a company's life, a dual-class structure can be beneficial. The structure can allow entrepreneurs to build for the long term—and even transform entire industries—without being subject to short-term pressure.

a. In what sense does this corporate structure relieve entrepreneurs from short-term pressure? Who might be applying short-term pressure to the entrepreneurs under a more typical corporate structure that has only one class of stock?

b. Jackson was careful to qualify his observation as applying "for a definite period of time early in a company's life." Why might this qualification be important?

Critical Thinking Exercises

CT8.1 For this exercise, your instructor may assign you to a group. What did you find surprising in this chapter, based on what you knew before you read it? Compare your answers with those of other students in your group. Write a paragraph on each topic that at least two students in the group found surprising and explain why the members of the group were surprised.

CT8.2 This chapter describes the concept of a firm's balance sheet. Individuals and households have balance sheets as well, and the broad categories in them are the same as those on a firm's balance sheet. That is, an asset is something that an individual owns, a liability is something that an individual owes, and net worth is the difference between the value of assets and the value of liabilities. Construct a balance sheet for yourself. You can make estimates about the type and value of assets, liabilities, and net worth. The focus of this exercise is on what counts as assets and what counts as liabilities for an individual.

CT8.3 You might have heard of the run on Silicon Valley Bank (SVB) in the spring of 2023. This question explores that event. Banks have specialized balance sheets. Checking accounts and other deposits by households and firms are the largest liabilities on a bank's balance sheet. Deposits are a liability to banks because they are funds the banks owe to customers, but deposits are an asset to the households and firms that made the deposits. Banks' major assets are its loans to customers and bonds that it has purchased. Households typically borrow from banks to buy cars and houses, and businesses borrow from banks when they need to finance inventories or to bridge the gap between payments they make and payments they receive. SVB had invested in bonds whose prices declined during 2022 and 2023. As a result, there was a run on the bank, which means that many depositors moved their money to other banks. Keeping in mind the concept of a firm's net worth, why would a bank's depositors be concerned by a decline in the value of a bank's assets?

Appendix

LEARNING OBJECTIVE: Explain the concept of present value.

Using Present Value

This chapter shows how corporations raise funds by issuing stocks and bonds. This appendix provides more detail to support that discussion by analyzing *present value* as a key concept in determining the prices of financial securities.

The Concept of Present Value

Firms raise funds by selling equity (stock) and debt (bonds and loans) to investors and lenders. If you own a share of stock or a bond, you will receive payments in the form of dividends or coupons over a number of years. Most people value funds they already have more highly than funds they will receive some time in the future. For example, you would probably not trade $1,000 you already have for $1,000 you will receive after one year. The longer you have to wait to receive a payment, the less value it will have for you, so $1,000 you will receive after two years is worth less to you today than $1,000 you will receive after one year. The value you give today to money you will receive in the future is called the future payment's **present value**. The present value of $1,000 you will receive in one year will be less than $1,000.

Present value The value in today's dollars of funds to be paid or received in the future.

Why is the $1,000 you will receive after one year less valuable to you than the $1,000 you already have? The most important reason is that if you have $1,000 today, you can use that $1,000 today. You can buy goods and services with the money and receive enjoyment from them. The $1,000 you receive in one year does not have direct use to you now.

A second reason is that prices will likely rise during the year you are waiting to receive your $1,000. So, when you finally do receive the $1,000 in one year, you will not be able to buy as much with it as you could buy with $1,000 today. Finally, there is some risk that you will not receive the $1,000 in one year. The risk may be very great if an unreliable friend borrows $1,000 from you and vaguely promises to pay you back in one year. The risk may be very small if you lend money to the federal government by buying a U.S. Treasury bond. In either case, though, there is at least some risk that you will not receive the funds promised.

When someone lends money, the lender expects to be paid back both the amount of the loan and some additional interest. Say that you are willing to lend $1,000 today if you are paid back $1,100 one year from now. In this case, you are charging $\$100/\$1{,}000 = 0.10$, or 10 percent interest on the funds you have loaned. Economists would say that you value $1,000 today as equivalent to the $1,100 to be received one year in the future.

Notice that $1,100 can be written as $\$1{,}000 \times (1 + 0.10)$. That is, the value of money received in the future is equal to the value of money in the present multiplied by 1 plus the interest rate, with the interest rate expressed as a decimal. Or:

$$\$1{,}100 = \$1{,}000 \times (1 + 0.10).$$

Notice, also, that if we divide both sides by $(1 + 0.10)$, we can rewrite this formula as:

$$\$1{,}000 = \frac{\$1{,}100}{(1 + 0.10)}.$$

The rewritten formula states that the present value is equal to the future value to be received in one year divided by 1 plus the interest rate. This formula is important because we can use it to convert any amount to be received in one year into its present value. Writing the formula generally, we have:

$$\text{Present value} = \frac{\text{Future value}_1}{(1+i)}.$$

The present value of funds to be received in one year—Future value$_1$—can be calculated by dividing the amount of those funds to be received by 1 plus the interest rate. With an interest rate of 10 percent, the present value of \$1,000,000 to be received one year from now is:

$$\frac{\$1{,}000{,}000}{(1+0.10)} = \$909{,}090.91.$$

This formula allows us to calculate the value today of funds that will be received in one year. But financial securities such as stocks and bonds involve promises to pay funds over many years. Therefore, it would be useful if we could expand this formula to calculate the present value of funds to be received more than one year in the future.

Go back to the original example, where we assumed that you were willing to loan out your \$1,000 for one year provided that you received 10 percent interest. Suppose you are asked to lend the funds for two years and that you are promised 10 percent interest per year for each year of the loan. That is, you are lending \$1,000, which at 10 percent interest will grow to \$1,100 after one year, and you are agreeing to loan that \$1,100 for a second year at 10 percent interest. So, after two years, you will be paid back $\$1{,}100 \times (1+0.10)$, or \$1,210. Or:

$$\$1{,}210 = \$1{,}000 \times (1+0.10) \times (1+0.10),$$

or:

$$\$1{,}210 = \$1{,}000 \times (1+0.10)^2.$$

This equation can also be rewritten as:

$$\$1{,}000 = \frac{\$1{,}210}{(1+0.10)^2}.$$

To put this equation in words, the \$1,210 you receive two years from now has a present value equal to \$1,210 divided by the quantity 1 plus the interest rate squared. If you agree to lend out your \$1,000 for three years at 10 percent interest, you will receive:

$$\$1{,}331 = \$1{,}000 \times (1+0.10)^3.$$

Notice, again, that:

$$\$1{,}000 = \frac{\$1{,}331}{(1+0.10)^3}.$$

You can probably see a pattern here. We can generalize the concept to say that the present value of funds to be received *n* years in the future—whether *n* is 1, 20, or 85 does not matter—equals the amount of the funds to be received divided by the quantity 1 plus the interest rate raised to the *n*th power. For instance, with an interest rate of 10 percent, the present value of \$1,000,000 to be received 25 years in the future is:

$$\text{Present value} = \frac{\$1{,}000{,}000}{(1+0.10)^{25}} = \$92{,}296.$$

Or, more generally:

$$\text{Present value} = \frac{\text{Future value}_n}{(1+i)^n},$$

where Future value$_n$ represents funds that will be received in *n* years.

Solved Problem 8A.1

How to Receive Your Contest Winnings

Suppose you win a contest and are given the choice of the following prizes:

***Prize 1*:** $50,000 to be received right away, with four additional payments of $50,000 to be received each year for the next 4 years

***Prize 2*:** $175,000 to be received right away

Explain which prize you would choose and the basis for your decision.

Solving the Problem

Step 1: Review the material. This problem involves applying the concept of present value, so you may want to review the section "The Concept of Present Value."

Step 2: Explain the basis for choosing the prize. Unless you need cash immediately, you should choose the prize with the highest present value.

Step 3: Calculate the present value of each prize. Prize 2 consists of one payment of $175,000 received right away, so its present value is $175,000. Prize 1 consists of five payments spread out over time. To find the present value of the prize, we must find the present value of each of these payments and add them together. To calculate present value, we must use an interest rate. Let's assume an interest rate of 10 percent. In that case, the present value of Prize 1 is:

$$\$50{,}000 + \frac{\$50{,}000}{(1+0.10)} + \frac{\$50{,}000}{(1+0.10)^2} + \frac{\$50{,}000}{(1+0.10)^3} + \frac{\$50{,}000}{(1+0.10)^4}$$

$$= \$50{,}000 + \$45{,}454.55 + \$41{,}322.31 + \$37{,}565.74 + \$34{,}150.67$$

$$= \$208{,}493.27$$

Step 4: State your conclusion. Prize 1 has the greater present value, so you should choose it rather than Prize 2.

Your Turn: For more practice, do related problems 8A.4, 8A.5, 8A.6, and 8A.7 at the end of this appendix.

Using Present Value to Calculate Bond Prices

Anyone who buys stocks or bonds is really buying a promise to receive certain payments—dividends in the case of stocks or coupons in the case of bonds. The price investors are willing to pay for a financial asset should be equal to the value of the payments they will receive as a result of owning the asset. Because most of the coupon or dividend payments will be received in the future, it is their present value that matters. We therefore have the following important idea: *The price of a financial asset should be equal to the present value of the payments to be received from owning that asset.*

Let's look at an example. Suppose that in 1996, General Electric issued a bond with an $80 coupon that will mature in 2026. It is now 2024, and that bond has been bought and sold by investors many times. You are considering buying it. If you buy the bond, you will receive two years of coupon payments plus a final payment of the bond's principal, or face value, of $1,000. Suppose, once again, that you need an interest rate of 10 percent to invest your funds. If the bond has a coupon of $80, the present value of the payments you receive from owning the bond—and, therefore, the present value of the bond—will be:

$$\text{Present value} = \frac{\$80}{(1+0.10)} + \frac{\$80}{(1+0.10)^2} + \frac{\$1{,}000}{(1+0.10)^2} = \$965.29.$$

That is, the present value of the bond will equal the present value of the three payments you will receive during the two years you own the bond. You should, therefore, be willing to pay $965.29 to own this bond and have the right to receive these payments from GE. This process of calculating present values of future payments is used to determine bond prices, with one qualification: The relevant interest rate used by investors in the bond market to calculate the present value and, therefore, the price of an existing bond is usually the coupon rate on comparable newly issued bonds. Therefore, the general formula for the price of a bond is:

$$\text{Bond price} = \frac{\text{Coupon}_1}{(1+i)} + \frac{\text{Coupon}_2}{(1+i)^2} + \ldots + \frac{\text{Coupon}_n}{(1+i)^n} + \frac{\text{Face value}}{(1+i)^n}.$$

where:

- Coupon_1 is the coupon payment to be received after one year.
- Coupon_2 is the coupon payment to be received after two years.
- Coupon_n is the coupon payment received in the year the bond matures.
- The ellipsis takes the place of the coupon payments—if any—received between the second year and the year when the bond matures.
- Face value is the amount that will be received when the bond matures.
- i is the interest rate on comparable newly issued bonds.

Using Present Value to Calculate Stock Prices

When you own a firm's stock, you are legally entitled to your share of the firm's profit. Remember that the payments a firm makes to its shareholders are called *dividends*. The price of a share of stock should equal the present value of the dividends investors expect to receive as a result of owning that stock. Therefore, the general formula for the price of a stock is:

$$\text{Stock price} = \frac{\text{Dividend}_1}{(1+i)} + \frac{\text{Dividend}_2}{(1+i)^2} + \ldots$$

Notice that this formula looks very similar to the one we used to calculate the price of a bond, with two important differences:

1. Unlike a bond, a share of stock has no maturity date, so we have to calculate the present value of an infinite number of dividend payments. It may seem that the stock's price must be infinite as well, but remember that dollars you receive many years in the future are worth very little today. For instance, a dividend payment of $10 that will be received 40 years in the future is worth only a little more than $0.20 today at a 10 percent interest rate.

2. You know with certainty the coupon payments you will receive from owning the bond because they are set when the bond is issued and cannot be changed (unless the firm that issued the bond declares bankruptcy). However, you don't know for sure what the dividend payments from owning a stock will be. The size of the dividend payment you will receive depends on how profitable the company is in the future.

Although it is possible to forecast the future profitability of a company, it cannot be done with perfect accuracy. To emphasize this point, some economists rewrite the basic stock price formula by adding a superscript *e* to each dividend term to emphasize that these are *expected* dividend payments. Because the future profitability of companies is often very difficult to forecast, it is not surprising that differences of opinion exist over what the price of a particular stock should be. Some investors will be optimistic about the future profitability of a company and will, therefore, believe that the company's stock should have a high price. Other investors might be pessimistic and believe that the company's stock should have a low price.

A Simple Formula for Calculating Stock Prices

It is possible to simplify the formula for determining the price of a stock. If we assume that dividends will grow at a constant rate, we get the following equation:

$$\text{Stock price} = \frac{\text{Dividend}}{(i - \text{Growth rate})}.$$

In this equation, Dividend is the dividend expected to be received one year from now, and Growth rate is the rate at which the dividends are expected to grow. If a company pays a dividend of $1 per share to be received one year from now and Growth rate is 10 percent, the company is expected to pay a dividend of $1.10 the following year, $1.21 the year after that, and so on.

Now suppose that IBM will pay a dividend of $5 per share at the end of the year, the consensus of investors is that IBM's dividends will increase at a rate of 5 percent per year for the indefinite future, and the interest rate is 10 percent. Then the price of IBM's stock should be:

$$\text{Stock price} = \frac{\$5.00}{(0.10 - 0.05)} = \$100.00.$$

In recent years, investors have debated whether the high prices of the stocks of many high-tech firms, including Lyft, X, and Snap, were justified, given that many of these companies had not made any profit yet and so had not paid any dividends. Is there any way that a rational investor would pay a high price for the stock of a firm that is currently not earning a profit? The formula for determining stock prices shows that it is possible, provided that the investor's assumptions are optimistic enough! For example, suppose that a stock analyst predicts that Lyft will soon be earning $1 per share of stock. That is, Lyft's total earnings divided by the number of shares of its stock outstanding would be $1. Suppose Lyft pays out that $1 in dividends and that the $1 will grow rapidly over the years, by, say, 7 percent per year. Then the formula indicates that the price of Lyft's stock should be:

$$\text{Stock price} = \frac{\$1.00}{(0.10 - 0.07)} = \$33.33.$$

If you are sufficiently optimistic about the future prospects of a company, a high stock price can be justified even if the company is not currently earning a profit. But investors in stocks must be careful. Suppose investors decide that the growth rate of Lyft's dividend is likely to be only 4 percent per year instead of 7 percent because they expect the firm to have trouble in some cities gaining market share from Uber, which would reduce the firm's profitability. Then our formula indicates that the price of Lyft's stock should be:

$$\text{Stock price} = \frac{\$1.00}{(0.10 - 0.04)} = \$16.67.$$

This price is only half the price determined assuming a more optimistic growth rate. We can conclude that investors use information about a firm's profitability and growth prospects to determine what the firm is worth.

Key Term

Present value, p. 292

8A Using Present Value

LEARNING OBJECTIVE: Explain the concept of present value.

Review Questions

8A.1 Why is money you receive at some future date worth less to you than money you receive today? If the interest rate rises, what effect does this have on the present value of payments you receive in the future?

8A.2 Give the formula for calculating the present value of a bond that will pay a coupon of $100 per year for 10 years and that has a face value of $1,000.

8A.3 Compare the formula for calculating the present value of the payments you will receive from owning a bond to the formula for calculating the present value of the payments you will receive from owning a stock. What are the key similarities? What are the key differences?

Problems and Applications

8A.4 **[Related to Solved Problem 8A.1]** If the interest rate is 10 percent, what is the present value of a bond that matures in 2 years, pays $85 1 year from now, and pays $1,085 2 years from now?

8A.5 **[Related to Solved Problem 8A.1]** Before the 2022 National Football League season, the San Francisco 49ers football team signed cornerback Charvarius Ward to a contract that would pay him a total of $13.5 million for the 2022 season, $14.0 million for the 2023 season, and $13.0 million for the 2024 season. Assume that Ward receives each of his three seasonal salaries as a lump-sum at the end of that year.

- **a.** One news article stated: "The San Francisco 49ers and free-agent cornerback Charvarius Ward have agreed to a three-year deal worth $40.5 million." How do you think the author arrived at $40.5 million as the value of the contract? Do you agree that $40.5 million was the value of this contract? Briefly explain.
- **b.** What was the present value of Ward's contract at the time he signed it, assuming an interest rate of 10 percent?
- **c.** If you use an interest rate of 5 percent, what was the present value of Ward's contract?

8A.6 **[Related to Solved Problem 8A.1]** In early 2023, the Powerball lottery was advertised as having a payoff of $700,000,000. The winner was given the choice of receiving $375,700,000 at once or equal annual payments over the next 30 years that would total $700,000,000.

- **a.** Is the lottery being accurate in stating that the winner will receive $700,000,000? Briefly explain.
- **b.** At an interest rate of 10 percent, what would be the present value of the 30 annual payments?
- **c.** At an interest rate of 5 percent, what would be the present value of the 30 annual payments?
- **d.** What interest rate would make the present value of the 30 payments equal to the one payment of $375,700,000? (This question is difficult and requires the use of a financial calculator or a spreadsheet. *Hint:* If you are familiar with the Excel spreadsheet program, use the RATE function. You can answer parts (b) and (c) by using the Excel PV [Present Value] function.)

8A.7 **[Related to Solved Problem 8A.1]** Before the start of the 2000 baseball season, the New York Mets decided that they didn't want Bobby Bonilla playing for them any longer. But Bonilla had a contract with the Mets for the 2000 season that would have obliged the Mets to pay him $5.9 million. When the Mets released Bonilla, he agreed to take the following payments in lieu of the $5.9 million the Mets would have paid him in the year 2000: He would receive 25 equal payments of $1,193,248.20 each July 1 from 2011 to 2035. If you were Bobby Bonilla, which would you rather have had, the lump-sum $5.9 million in 2000 or the 25 payments beginning in 2011? Explain the basis for your decision.

8A.8 Suppose that eLake, an online auction site, is paying a dividend of $2 per share. You expect this dividend to grow 2 percent per year, and the interest rate is 10 percent. What is the most you would be willing to pay for a share of stock in eLake? If the interest rate is 5 percent, what is the most you would be willing to pay? When interest rates in the economy decline, would you expect stock prices in general to rise or fall? Briefly explain.

8A.9 Suppose you buy the bond of a large corporation at a time when the inflation rate is very low. If the inflation rate increases during the time you hold the bond, briefly explain what is likely to happen to the price of the bond.

9

Comparative Advantage and the Gains from International Trade

Are We Facing the End of Globalization?

Amazon is headquartered in Seattle, Washington, but more than a quarter of its sales are outside the United States. Caterpillar, which manufactures construction and earth-moving equipment, is headquartered in Irving, Texas, but nearly half its sales are outside the United States. Most large U.S. corporations have substantial foreign sales, as do most large corporations in Europe, Japan, and other countries. The extensive flow of imports and exports around the world is the result of *globalization*, or the process of countries becoming more open to foreign trade and investment. The current era of globalization began following the end of World War II in 1945. Globalization accelerated during the 1980s and 1990s for reasons we'll discuss in this chapter.

But in 2023, some economists and policymakers debated whether the world economy might be entering a period in which countries would take steps to rely less on imports and instead produce more goods domestically. Three factors seemed to be driving the movement away from globalization: (1) In several countries, including the United States, governments were increasingly willing to protect domestic industries from foreign competition; (2) the disruptions to international supply chains caused by the Covid–19 pandemic led some firms to engage in *reshoring*, or increasing their domestic production; and (3) an increase in political tensions resulting from Russia's invasion of Ukraine and China's threats to the independence of Taiwan, led some countries to limit trade in a broad number of goods with Russia and in certain key goods—such as advanced semiconductors—with China.

Historically, most U.S. presidential administrations strongly supported globalization, but that changed under the Trump and Biden administrations. President Trump imposed tariffs on some goods. President Biden signed an executive order strengthening the federal government's "Buy American" program. The executive order was intended to reduce the quantity of imported goods the federal government buys.

Justin Sullivan/Getty Images

Buy American programs strike many people as reasonable. But several foreign governments argued that the program violated the commitment of the United States under the World Trade Organization to allow foreign firms to compete in selling goods to the federal government. If these governments enacted similar programs, U.S. firms would no longer be able to compete to supply goods to foreign infrastructure projects.

Tariffs can also damage some domestic firms. When the Trump administration in 2018 raised tariffs on imports of steel and aluminum, U.S. firms, such as Whirlpool, which uses steel and aluminum in its washing machines, found their production costs rising. Consumers lost as a result of these tariffs because Whirlpool raised its prices to offset the higher production costs.

Many economists are critical of actions, like tariffs or Buy American programs, that interfere with international trade. They maintain that free international trade improves economic efficiency because it results in goods being produced at the lowest opportunity cost.

But arguments in favor of free trade are unconvincing to workers who have lost their jobs. More than 2 million U.S. manufacturing jobs may have been lost to Chinese imports since 1999, although trade with China has created other jobs throughout the U.S. economy. Does eliminating government restrictions on international trade help or hurt workers and consumers in the United States? Few government policies are as hotly debated as those involving international trade. In this chapter, we will explore the economics of trade and the debate over trade policies.

Chapter Outline & Learning Objectives

9.1 The United States in the International Economy, page 300
Discuss the role of international trade in the U.S. economy.

9.2 Comparative Advantage in International Trade, page 303
Explain the difference between comparative advantage and absolute advantage in international trade.

9.3 How Countries Gain from International Trade, page 304
Explain how countries gain from international trade.

9.4 Government Policies That Restrict International Trade, page 313
Analyze the economic effects of government policies that restrict international trade.

9.5 The Debate over Trade Policies and Globalization, page 321
Evaluate the debate over trade policies and globalization.

Economics in Your Life & Career

Should a Member of Congress Support a Tariff on Running Shoes?

Suppose that you are an aide to a member of Congress who is considering whether to vote for a bill that would eliminate the U.S. tariff on running shoes. She asks you to prepare a memorandum recommending how she should vote, taking into account both the economic interests of the firms and workers in her district and the broader interests of the U.S. economy as a whole. What facts and conclusions from the economic analysis of international trade should you include in your memorandum? As you read the chapter, try to answer this question. You can check your answer against the one we provide at the end of the chapter.

Trade is simply the act of buying or selling. Is there a difference between trade that takes place within a country and international trade? Within the United States, domestic trade makes it possible for consumers in Ohio to eat salmon caught in Alaska and for consumers in Montana to drive cars built in Michigan or Kentucky. Similarly, international trade makes it possible for consumers in the United States to drink wine from France and wear a sweater made in Bangladesh. One significant difference between domestic trade and international trade is that international trade is more controversial. At one time, nearly all the televisions, shoes, clothing, and toys bought in the United States were also produced here. Today, firms in other countries produce most of these goods. This shift has benefited U.S. consumers because foreign-made goods have lower prices or higher quality than the U.S.-made goods they have replaced. At the same time, though, many U.S. firms that produced these goods have gone out of business, and their workers have had to find other jobs. Some cities in the industrial Midwest have been devastated as factories have closed down and few new firms have replaced them. Some families that had worked for several generations in the same factory experienced major income declines or had to move elsewhere to find jobs. Cities and towns in New England and in the Carolinas and Georgia have faced similar difficulties, as shoe, clothing, textile, and furniture factories have closed in the face of foreign competition. Not surprisingly, opinion polls show that some Americans favor reducing international trade because they believe doing so will preserve jobs in the United States. But is this belief accurate?

We can use the tools of demand and supply to analyze markets for internationally traded goods and services. We have seen that trade in general—whether within a country or between countries—is based on the principle of comparative advantage (see Chapter 2, Section 2.2). In this chapter, we look more closely at the role of comparative advantage in international trade. We also use the concepts of consumer surplus, producer surplus, and deadweight loss (see Chapter 4, Section 4.2) to analyze government policies that interfere with trade. With this background, we can return to the political debate over whether the United States benefits from international trade. We begin by looking at the role international trade plays in the U.S. economy.

9.1 The United States in the International Economy

LEARNING OBJECTIVE: Discuss the role of international trade in the U.S. economy.

International trade has grown tremendously over the past 50 years, due primarily to three factors:

1. **The decreasing costs of shipping products and traveling internationally.** Firms can use large container ships to send their products across oceans at low cost. Businesspeople today can travel internationally using fast, inexpensive, and reliable air transportation.
2. **The spread of inexpensive and reliable communications.** The internet, smartphones, text messaging, and video conferencing allow managers to communicate instantaneously and at very low cost with customers and suppliers around the world. In addition, artificial intelligence (AI) produces accurate machine translations of text and speech, which helps sellers reach consumers who speak different languages.
3. **Changes in government policies.** Over the past 50 years, many governments around the world have changed their policies to facilitate international trade.

The most important change in government policy that has helped expand trade is cutting tariff rates. A **tariff** is a tax imposed by a government on *imports* into a country. **Imports** are goods and services purchased domestically that have been produced in other countries. In the 1930s, the United States charged an average tariff rate above 50 percent. Today, the rate is less than 1.5 percent. In North America, most tariffs between Canada, Mexico, and the United States were eliminated following the passage of the *North American Free Trade Agreement* (*NAFTA*) in 1994, which was replaced in 2020 by a similar agreement, the *United States–Mexico–Canada Agreement* (*USMCA*). In 1993, 12 countries in Europe formed the European Union (EU), which has eliminated all tariffs among member countries, greatly increasing both imports and **exports**, which are goods and services produced domestically and sold in other countries. The EU expanded over the years to include 27 countries in 2023.

Tariff A tax imposed by a government on imports.

Imports Goods and services purchased domestically that are produced in other countries.

Exports Goods and services produced domestically and sold in other countries.

The topic of trade restrictions has been in the news for several years. For example, the United Kingdom withdrew from the European Union in 2020 and faced new barriers to trading with the remaining members. In 2021, the Trump administration withdrew from negotiations aimed at concluding the *Trans-Pacific Partnership* (*TPP*), an agreement intended to increase trade between the United States and 11 other countries around the Pacific Ocean, including Canada, Japan, Mexico, and Vietnam. The Trump administration also imposed new tariffs on some imports from China, Canada, and Europe, which resulted in those governments imposing retaliatory tariffs on some U.S. exports. As noted in the chapter opener, economists and policymakers have begun considering additional government trade restrictions. For example, the Biden administration has expanded the Buy American program, reducing the ability of foreign companies to sell goods to the federal government and increasing the possibility of foreign governments retaliating by imposing new restrictions on exports from the United States.

The Importance of Trade to the U.S. Economy

U.S. consumers are buying increasing quantities of goods and services produced in other countries. At the same time, U.S. businesses are selling increasing quantities of goods and services to consumers in other countries. Figure 9.1 shows that since 1970, both exports and imports have tended to increase as a fraction of U.S. *gross domestic product* (*GDP*). (The shaded areas in the figure represent years in which the U.S. economy was in a recession.) GDP is the value of all the final goods and services produced in a country during a year. World trade declined sharply during the severe worldwide recession of 2007–2009 and has grown relatively slowly since that time. The slowdown in trade was likely due to slower income growth in some countries, including China, Brazil, and many countries in Europe, combined with some firms deciding to produce fewer of their products in foreign countries and actions by some governments to limit imports.

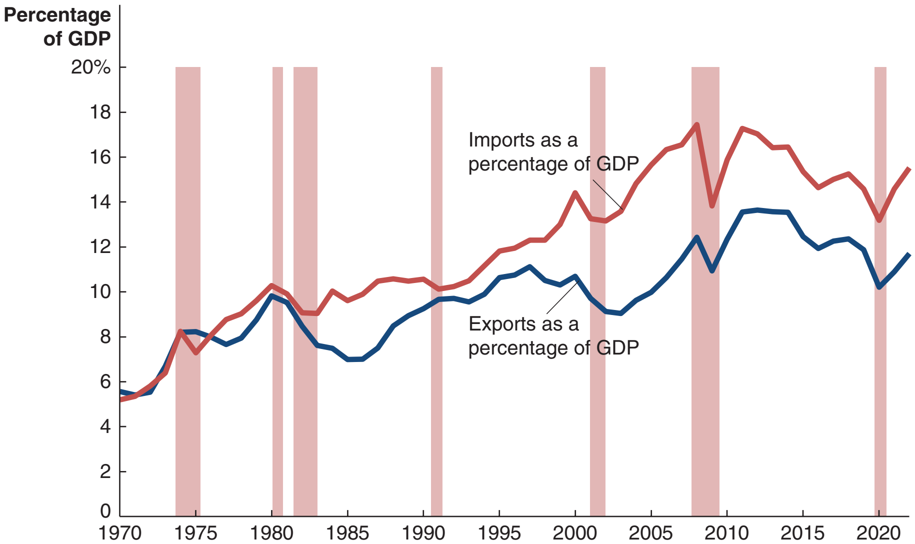


Figure 9.1

The Increasing Importance of International Trade to the United States

Exports and imports of goods and services as a percentage of total production—measured by GDP—show the importance of international trade to an economy. Despite the lingering effects of the Covid–19 pandemic, in 2022, both imports and exports were much larger fractions of U.S. GDP than they were in 1970. The shaded areas in the figure represent years in which the U.S. economy was in a recession.

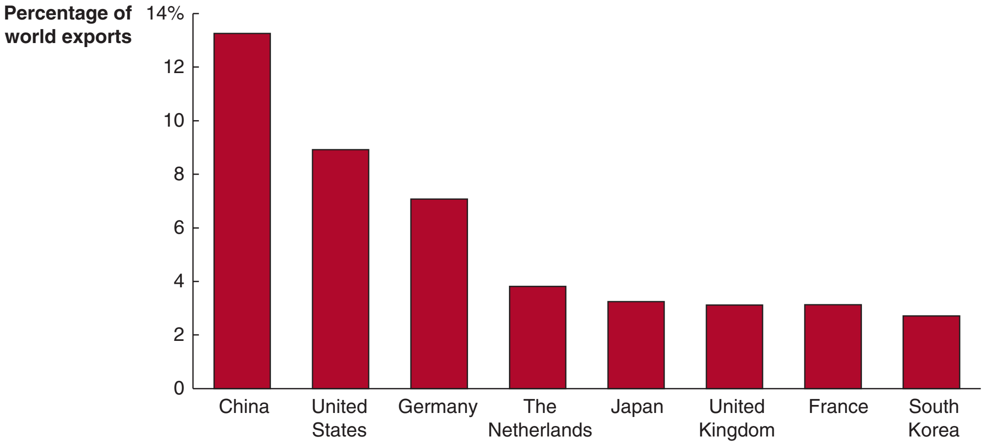
Source: U.S. Department of Commerce, Bureau of Economic Analysis.

Figure 9.2

The Eight Leading Exporting Countries

In 2021, China was the leading exporting country, accounting for 13.3 percent of total world exports. The United States was second, with an 8.9 percent share. The values are the shares of total world exports of merchandise and commercial services.

Source: World Trade Organization.



The Covid–19 pandemic led to a sharp decline in world trade during 2020. Despite that decline and the slowing in the growth of trade over the long run, as a percentage of GDP, U.S. exports more than doubled and U.S. imports nearly tripled between 1970 and 2022.

Not all sectors of the U.S. economy are affected equally by international trade. For example, although it's difficult to import or export some services, such as haircuts and appendectomies, a large percentage of U.S. agricultural production is exported. In a typical year, the United States exports about 50 percent of its wheat and rice crops and 20 percent of its corn crop.

Many U.S. manufacturing industries also depend on trade. About 20 percent of U.S. manufacturing jobs depend directly or indirectly on exports. In some industries, such as pharmaceutical drugs, output is directly exported. In other industries, such as steel, output is used to make other products, such as bulldozers or machine tools, that are then exported. In all, about two-thirds of U.S. manufacturing industries depend on exports for at least 10 percent of jobs.

U.S. International Trade in a World Context

The United States is the second-largest exporter in the world, just behind China, as Figure 9.2 illustrates. Six of the other seven leading exporting countries are also high-income countries. Although China is still a relatively low-income country, the rapid growth of the Chinese economy over the past 35 years has resulted in its becoming the largest exporter. Three of the top eight exporting countries are in East Asia, four are in Western Europe, and one is in North America.

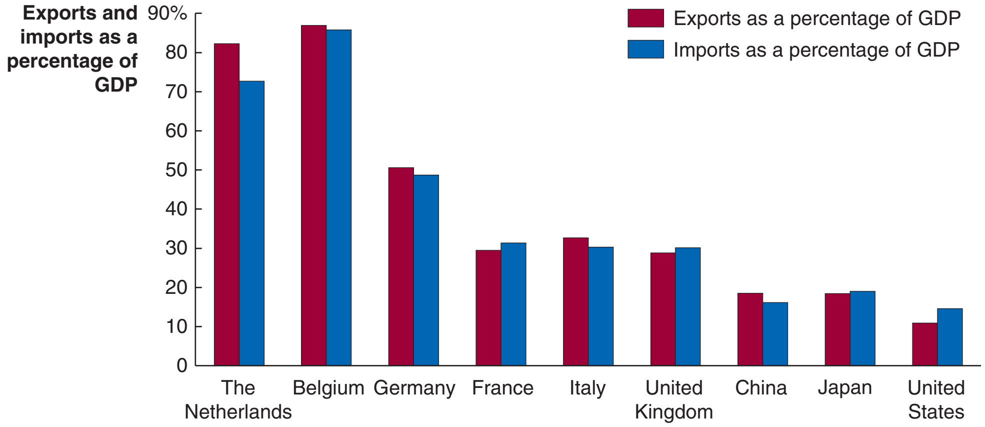
Figure 9.3 shows that international trade is less important to the United States than it is to many other countries, with imports and exports being lower percentages of GDP. In some smaller countries, such as Belgium and the Netherlands, imports and exports each make up more than three-quarters of GDP. In the larger European economies, imports and exports each make up one-quarter to one-half of GDP.

Figure 9.3

International Trade as a Percentage of GDP

International trade is still less important to the United States than it is to most other countries. In some smaller countries, such as Belgium and the Netherlands, imports and exports have values that are greater than 75 percent of GDP. In the larger European economies, imports and exports have values between 25 percent and 50 percent of GDP.

Source: Organization for Economic Co-operation and Development, "Trade in Goods and Services," February 8, 2023.



9.2 Comparative Advantage in International Trade

LEARNING OBJECTIVE: Explain the difference between comparative advantage and absolute advantage in international trade.

Why do businesses around the world look for markets in other countries? Why do consumers purchase goods and services made in other countries? People trade for one reason: Trade makes them better off. Whenever a buyer and seller agree to a sale, they must both believe that the exchange will make them better off; otherwise, there would be no sale. This conclusion holds whether the buyer and seller live in the same city or in different countries. As we will see, governments are more likely to interfere with international trade than they are with domestic trade, but the reasons for the interference are more political than economic.

A Brief Review of Comparative Advantage

Recall that **comparative advantage** is the ability of an individual, a firm, or a country to produce a good or service at a lower opportunity cost than competitors. **Opportunity cost** is the highest-valued alternative that must be given up to engage in an activity. People, firms, and countries specialize in economic activities in which they have a comparative advantage. In trading, we benefit from the comparative advantage of other people (or firms or countries), and they benefit from our comparative advantage.

Comparative advantage The ability of an individual, a firm, or a country to produce a good or service at a lower opportunity cost than competitors.

Opportunity cost The highest-valued alternative that must be given up to engage in an activity.

A good way to think of comparative advantage is to recall the example of you and your neighbor picking fruit (see Chapter 2, Section 2.2). Your neighbor is better at picking both apples and cherries than you are. Why, then, doesn't your neighbor pick both types of fruit? Because the opportunity cost to your neighbor of picking her own apples is very high: She is a particularly skilled cherry picker, and every hour spent picking apples is an hour taken away from picking cherries. You can pick apples at a much lower opportunity cost than your neighbor, so you have a comparative advantage in picking apples. Your neighbor can pick cherries at a much lower opportunity cost than you can, so she has a comparative advantage in picking cherries. Your neighbor is better off specializing in picking cherries, and you are better off specializing in picking apples. You can then trade some of your apples for some of your neighbor's cherries, and both of you will end up with more of each fruit. (If you have trouble following the point here, review Chapter 2, Tables 2.1 and 2.2.)

Comparative Advantage and Absolute Advantage

The principle of comparative advantage can explain why people pursue different occupations. It can also explain why countries produce different goods and services. International trade involves many countries importing and exporting many different goods and services. Countries are better off if they specialize in producing the goods for which they have a comparative advantage. They can then trade for the goods for which other countries have a comparative advantage.

We can illustrate why specializing on the basis of comparative advantage makes countries better off with a simple example involving just two countries and two products. Suppose the United States and China produce only smartphones and wheat. Assume that each country uses only labor to produce each good and that there are no differences between Chinese and U.S. smartphones or between Chinese and U.S. wheat. Table 9.1 shows how much each country can produce of each good with one hour of labor.

Table 9.1

An Example of U.S. Workers Being More Productive Than Chinese Workers

	Output per Hour of Work	
	Smartphones	Wheat (bushels)
China	4	2
United States	6	12

Table 9.2

The Opportunity Costs of Producing Smartphones and Wheat

The table shows the opportunity cost each country faces in producing smartphones and wheat. For example, the first entry in the "Wheat" column shows that China must give up 2 smartphones for every bushel of wheat it produces.

	Opportunity Costs	
	Smartphones	Wheat (bushels)
China	0.5 bushel of wheat	2 smartphones
United States	2 bushels of wheat	0.5 smartphone

Absolute advantage The ability of an individual, a firm, or a country to produce more of a good or service than competitors, using the same amount of resources.

Notice that U.S. workers are more productive than Chinese workers in making both goods. In one hour, U.S. workers can produce six times as many bushels of wheat and one and one-half times as many smartphones as Chinese workers. The United States has an *absolute advantage* over China in producing both goods. **Absolute advantage** is the ability to produce more of a good or service than competitors when using the same amount of resources. In this case, the United States can produce more of both goods using the same amount of labor as China.

It might seem at first that the United States has nothing to gain from trading with China because it has an absolute advantage in producing both goods. However, the United States is better off specializing in producing only wheat and obtaining smartphones by exporting wheat to China in exchange for smartphones. The reason the United States benefits from trade is that although it has an *absolute advantage* in the production of both goods, it has a *comparative advantage* only in the production of wheat. China has a comparative advantage in the production of smartphones.

If it seems contrary to common sense that the United States should import smartphones from China even though the United States can produce more smartphones per hour of labor, think about the opportunity cost to each country of producing each good, which we show in Table 9.2. If China wants to produce more wheat, it has to switch labor away from smartphone production. Every hour of labor switched from producing smartphones to producing wheat reduces smartphone production by 4 and increases wheat production by 2 bushels. Therefore, China has to give up 4 smartphones for every 2 bushels of wheat it produces. That means the opportunity cost to China of producing 1 more bushel of wheat is 4/2, or 2 smartphones.

If the United States switches one hour of labor from smartphones to wheat, production of smartphones falls by 6, and production of wheat rises by 12 bushels. That means the opportunity cost to the United States of producing 1 more bushel of wheat is 6/12, or 0.5 smartphone. The United States has a lower opportunity cost of producing wheat and, therefore, has a comparative advantage in making this product. By similar reasoning, we can see that China has a comparative advantage in producing smartphones.

9.3 How Countries Gain from International Trade

LEARNING OBJECTIVE: Explain how countries gain from international trade.

Autarky A situation in which a country does not trade with other countries.

Can the United States really gain from producing only wheat and trading some of it to China for smartphones? To see that it can, assume at first that China and the United States do not trade with each other. A situation in which a country does not trade with other countries is called **autarky**. Assume that in autarky, each country has 1,000 hours of labor available to produce the two goods, and each country produces the quantities of the two goods shown in Table 9.3. Because there is no trade, these quantities also represent consumption of the two goods in each country.

Table 9.3

Production without Trade

	Production and Consumption	
	Smartphones	Wheat (bushels)
China	1,000	1,500
United States	1,500	9,000

Increasing Consumption through Trade

Suppose now that China and the United States begin to trade with each other. The **terms of trade** is the ratio at which a country can trade its exports for imports from other countries. For simplicity, let's assume that the terms of trade end up with China and the United States being willing to trade one smartphone for one bushel of wheat, even though we know that in reality the price of a smartphone is much higher than the price of a bushel of wheat.

Terms of trade The ratio at which a country can trade its exports for imports from other countries.

Once trade has begun, the United States and China can exchange wheat for smartphones or smartphones for wheat. Consider the example shown in Table 9.4: If China specializes by using all 1,000 available hours of labor to produce smartphones, it will be able to produce 4,000 smartphones. It could then export 1,500 smartphones to the United States in exchange for 1,500 bushels of wheat. (Remember that we are assuming the terms of trade are 1 smartphone for 1 bushel of wheat.) China ends up with 2,500 smartphones and 1,500 bushels of wheat. Compared with the situation before trade, China has the same amount of wheat but 1,500 more smartphones. If the United States specializes in producing wheat, it will be able to produce 12,000 bushels of wheat. It could then export 1,500 bushels of wheat to China in exchange for 1,500 smartphones. The United States ends up with 10,500 bushels of wheat and 1,500 smartphones. Compared with the situation before trade, the United States has the same number of smartphones but 1,500 more bushels of wheat. Trade has allowed both countries to increase the quantities of goods consumed.

By trading, China and the United States are able to consume more than they could consume without trade. This outcome is possible because world production of both

Table 9.4

Gains from Trade for China and the United States

Without Trade

Production and Consumption with No Trade

	Smartphones	Wheat
China	1,000	1,500
United States	1,500	9,000

With Trade

	Production with Trade		Trade		Consumption with Trade	
	Smartphones	**Wheat**	**Smartphones**	**Wheat**	**Smartphones**	**Wheat**
China	4,000	0	**Export** 1,500	**Import** 1,500	2,500	1,500
United States	0	12,000	**Import** 1,500	**Export** 1,500	1,500	10,500

With trade, the United States and China specialize in the good they have a comparative advantage in producing …

… and export some of that good in exchange for the good the other country has a comparative advantage in producing.

Gains from Trade

Increased Consumption

China	1,500 Smartphones
United States	1,500 Bushels of wheat

The increased consumption made possible by trade represents the gains from trade.

goods increases after trade. (In this example, our "world" consists of just the United States and China.)

Why does total production of smartphones and wheat increase when China specializes in producing smartphones and the United States specializes in producing wheat? A domestic analogy helps answer this question: If a company shifts production from an old factory to a more efficient modern factory, its output will increase. Similarly, if a farmer shifts from growing wheat on land that is suffering from soil exhaustion to land that is fertile, the farmer's wheat output will increase. The same thing happens in our example. Producing any wheat in China or any smartphones in the United States is inefficient. Shifting production to the more efficient country—the one with the comparative advantage—increases total production of both goods. The key point is: *Countries gain from specializing in producing goods in which they have a comparative advantage and trading for goods in which other countries have a comparative advantage.*

Solved Problem 9.3

The Gains from Trade

The first discussion of comparative advantage appears in *On the Principles of Political Economy and Taxation*, a book written by the British economist David Ricardo in 1817. Ricardo provided a famous example of the gains from trade, using wine and cloth production in Portugal and England. The following table is adapted from Ricardo's example, with cloth measured in sheets and wine measured in kegs:

	Output per Year of Labor	
	Cloth (sheets)	Wine (kegs)
Portugal	100	150
England	90	60

a. Explain which country has an absolute advantage in the production of each good.

b. Explain which country has a comparative advantage in the production of each good.

c. Suppose that Portugal and England currently do not trade with each other. Each country has 1,000 workers, so each has 1,000 years of labor time to use in producing cloth and wine, and the countries are currently producing the amounts of each good shown in the following table:

	Cloth (sheets)	Wine (kegs)
Portugal	18,000	123,000
England	63,000	18,000

Show that Portugal and England can both gain from trade. Assume that the terms of trade are that one sheet of cloth can be traded for one keg of wine.

Solving the Problem

Step 1: Review the chapter material. This problem is about absolute and comparative advantage and the gains from trade, so you may want to review the sections "Comparative Advantage in International Trade" and "How Countries Gain from International Trade."

Step 2: Answer part (a) by determining which country has an absolute advantage. Remember that a country has an absolute advantage over another country when it can produce more of a good using the same resources. The first table in the problem shows that Portugal can produce more cloth *and* more wine with 1 year's worth of labor than England can. Therefore, Portugal has an absolute advantage in the production of both goods, and England does not have an absolute advantage in the production of either good.

Step 3: Answer part (b) by determining which country has a comparative advantage. A country has a comparative advantage when it can produce a good at a lower opportunity cost. To produce 100 sheets of cloth, Portugal must give up producing 150 kegs of wine. Therefore, Portugal's opportunity cost of producing 1 sheet of cloth is 150/100, or 1.5 kegs of wine. England has to give up producing 60 kegs of wine to produce 90 sheets of cloth, so its opportunity cost of producing 1 sheet of cloth is 60/90, or 0.67 keg of wine.

The opportunity costs of producing wine can be calculated in the same way. The following table shows the opportunity cost to Portugal and England of producing each good:

	Opportunity Costs	
	Cloth (sheets)	Wine (kegs)
Portugal	1.5 kegs of wine	0.67 sheet of cloth
England	0.67 keg of wine	1.5 sheets of cloth

Portugal has a comparative advantage in wine because its opportunity cost is lower. England has a comparative advantage in cloth because its opportunity cost is lower.

Step 4: Answer part (c) by showing that both countries can benefit from trade. By now it should be clear that both countries will be better off if they specialize in producing the good for which they have a comparative advantage and trade for the other good. The following table is very similar to Table 9.4 and shows one example of trade making both countries better off. (To test your understanding, try constructing another example.)

Without Trade		
	Production and Consumption	
	Cloth (sheets)	Wine (kegs)
Portugal	18,000	123,000
England	63,000	18,000

With Trade						
	Production with Trade		Trade		Consumption with Trade	
	Cloth	Wine	Cloth	Wine	Cloth	Wine
Portugal	0	150,000	Import 18,000	Export 18,000	18,000	132,000
England	90,000	0	Export 18,000	Import 18,000	72,000	18,000

Gains from Trade	
	Increased Consumption
Portugal	9,000 kegs of wine
England	9,000 sheets of cloth

Your Turn: For more practice, do related problems 3.5 and 3.6 at the end of this chapter.

Why Don’t We See Complete Specialization?

In our example of two countries producing only two products, each country specializes in producing one of the goods. In the real world, many goods and services are produced in more than one country. For example, the United States, Japan, Germany, China, Canada, Brazil, Mexico, and India produce automobiles. We do not see complete specialization in the real world for three main reasons:

1. **Not all goods and services are traded internationally.** For example, even if Japan had a comparative advantage in the production of medical services, it would be difficult for the country to specialize in producing medical services and then export them. For example, it wouldn’t be practical for U.S. patients who need appendectomies to fly to Japan to receive them from surgeons there.

2. **Production of most goods involves increasing opportunity costs.** Recall that production of most goods involves increasing opportunity costs (see Chapter 2, Section 2.1). Although we didn't include this fact in our example, if the United States devotes more workers to producing wheat, the opportunity cost of producing more wheat will increase. At some point, the opportunity cost of producing wheat in the United States may rise to the level of the opportunity cost of producing wheat in China. When that happens, international trade will no longer push the United States further toward specialization. The same will be true of China: The increasing opportunity cost of producing smartphones will cause China to stop short of complete specialization.
3. **Tastes for products differ.** Most products are *differentiated*. Smartphones, laptops, cars, and televisions—to name just a few products—have a variety of features. When buying automobiles, some people look for reliability and fuel efficiency, others look for room to carry seven passengers, and still others want styling and high performance. So, some car buyers prefer Toyota Prius hybrids, some prefer Ford F-150s, and others prefer BMWs. As a result, Japan, the United States, and Germany may each have a comparative advantage in producing different types of automobiles.

Does Anyone Lose as a Result of International Trade?

In our smartphone and wheat example, consumption increases in both the United States and China as a result of trade. Everyone gains, and no one loses—or do they? In our example, we referred repeatedly to "China" or the "United States" producing smartphones or wheat. But countries do not produce goods; firms do. In a world without trade, there would be smartphone firms and wheat farms in both China and the United States. In a world with trade, there would be only Chinese smartphone firms and U.S. wheat farms. Chinese wheat farms and U.S. smartphone firms would be competed out of business. Overall, total employment would not change, and production would increase as a result of trade. Nevertheless, the owners of Chinese wheat farms, the owners of U.S. smartphone firms, and the people who work for them are worse off as a result of trade. The losers from trade are likely to try to persuade the Chinese and U.S. governments to interfere with trade by barring imports of the competing products from the other country or by imposing high tariffs on them.

Don't Let This Happen to You

Remember That Trade Creates Both Winners and Losers

The following statement is from a Federal Reserve publication: "Trade is a win–win situation for all countries that participate." People sometimes interpret statements like this to mean that there are no losers from international trade. But notice that the statement refers to *countries*, not individuals. When countries participate in trade, they make their consumers better off by increasing the quantity of goods and services available to them.

As we have seen, however, expanding trade eliminates the jobs of workers employed at companies that are less efficient than foreign companies. Trade also creates new jobs at companies that export products to foreign markets. But it may be difficult for workers who lose their jobs because of trade to easily find others. That is why in the United States the federal government uses the *Trade Adjustment Assistance* (*TAA*) program to provide funds for workers who have lost their jobs due to international trade. Qualified unemployed workers can use these funds to pay for retraining, searching for new jobs, or relocating to areas where new jobs are available. This program—which is similar to programs in other countries—recognizes that there are losers from international trade as well as winners.

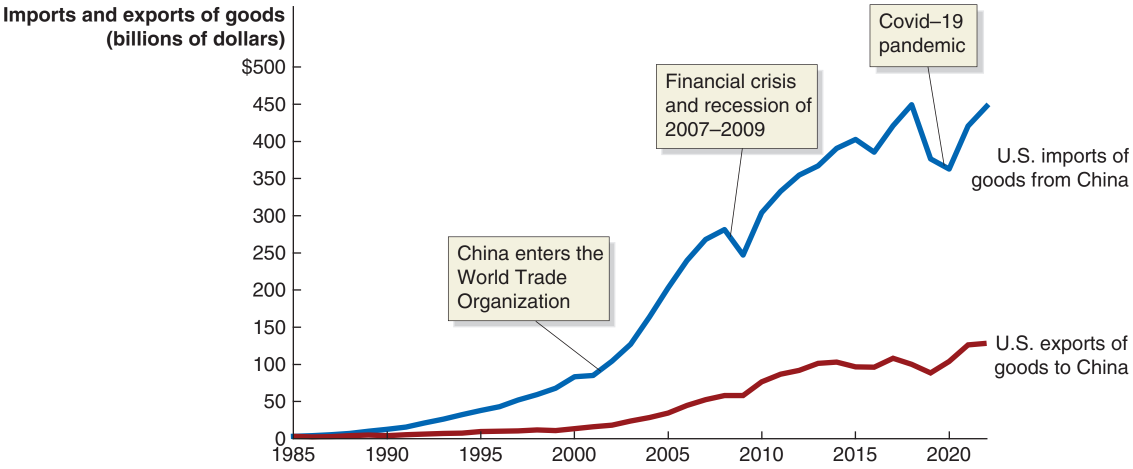
Your Turn: Test your understanding by doing related problem 3.11 at the end of this chapter.

Apply the Concept

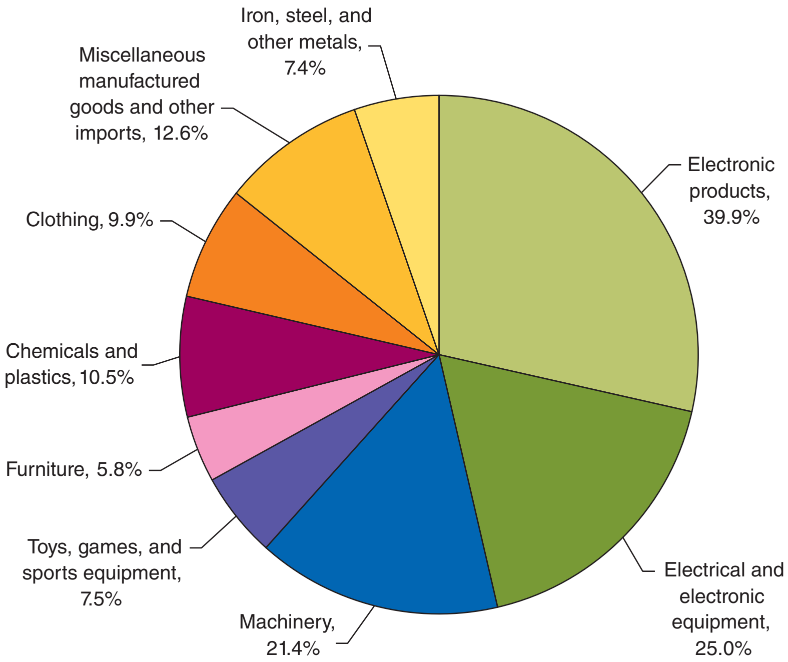
Who Gains and Who Loses from U.S. Trade with China, Economically . . . and Politically?

During his time in office, former President Donald Trump criticized what he saw as unbalanced trade between the United States and China: "We can no longer have massive trade deficits . . . and job losses." From Mao Zedong's founding of the People's Republic of China in 1949 until the mid-1970s, China was a centrally planned economy that rejected free markets and had very little trade with the United States. Beginning in the 1970s, when Deng Xiaoping succeeded Mao as leader of China, the government adopted market-based reforms of the economy and began exporting significant quantities of goods to the United States and other countries. This trend accelerated after China became a member of the World Trade Organization (WTO) in 2001, which gave it greater access to world markets. The WTO was founded in 1994 to promote trade among market economies.

The following figure shows the growth since 1985 in U.S. imports of goods from China and U.S. exports to China. While U.S. exports of goods to China were more than 40 times higher in 2022 than in 1985, the dollar increase in U.S. imports of goods from China was more than 100 times larger. As a result, the gap between U.S. imports of goods from China and exports to China (the U.S. trade deficit with China) swelled from zero in 1985 to nearly $450 billion in 2022. Some economists and policymakers use the term *China shock* to describe the surge in Chinese imports beginning in 2001.

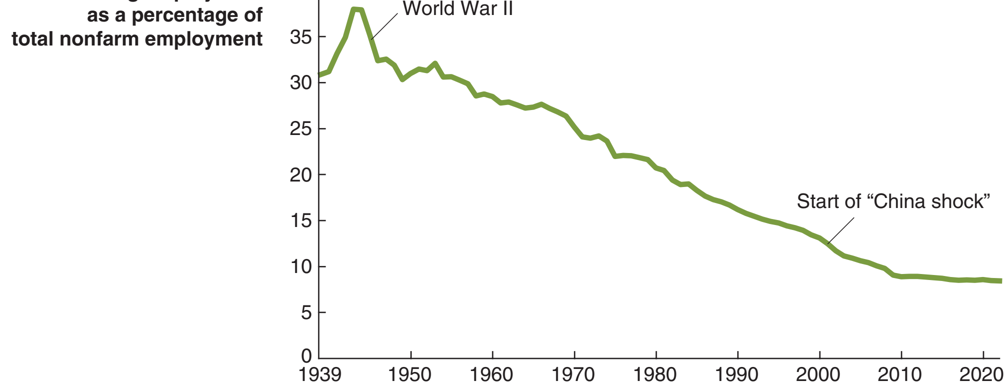


The following figure shows the distribution of U.S. imports of goods from China by broad product categories. Many of the products the United States currently imports from China were at one time manufactured in the United States. Chinese firms were able to win a large share of these markets typically by offering goods at lower prices than U.S. firms (or firms in other foreign countries that were also competing in the U.S. market). These lower prices have benefited U.S. consumers. Lower-income consumers in particular have benefitted from the low prices of textile products, such as clothing, sheets, and towels. Smartphones and other consumer electronics products would have much higher prices if they were assembled in the United States rather than in China and other foreign countries. (However, as we saw in the *Apply the Concept* in Chapter 2, U.S. firms have been able to produce some components of iPads and other consumer electronics.)



Because consumers pay lower prices for goods imported from China, they have more of their income available to spend on other goods and services produced in the United States. A family that buys low-priced Chinese-made clothes at Walmart can more easily afford to dine out at the local Red Lobster restaurant or to buy fresh fruits and vegetables grown at local farms. In this sense, the losses suffered by U.S. firms (and their workers) that have been forced out of business by Chinese competitors have resulted in gains to other U.S. firms (and their workers).

But David Autor of the Massachusetts Institute of Technology and other economists studying the effects of the China shock on the U.S. economy point out that the firms most hurt by Chinese imports have been concentrated in certain states, particularly in the Midwest and Southeast. As noted in the chapter opener, some cities in these areas have been devastated as local manufacturing plants have closed and workers have had difficulty finding other jobs. Trade with China is not the main reason that manufacturing employment has declined as a percentage of the U.S. labor force. As the following figure shows, the percentage of U.S. workers employed in manufacturing began declining long before the China shock began. In 1946, after the end of World War II, 32 percent of U.S. workers were employed in manufacturing. At the start of the surge in imports from China in 2001, only about 12 percent of workers were engaged in manufacturing. (Manufacturing employment was about 8 percent of total employment in 2022.)



Autor, David Dorn of the University of Zurich, and Gordon Hanson of the University of California, San Diego estimate that between 1999 and 2011, the China shock resulted in the loss of 2.4 million jobs and may have accounted for 25 percent of the decline in manufacturing jobs during those years. Although *total* employment in the United States increased by 2.7 million over the same period, the job losses due to the China shock happened relatively quickly and were heavily concentrated in manufacturing industries. The fraction of the population employed declined in areas most exposed to Chinese imports and recovered only slowly, which indicates that workers who lost their jobs struggled to find new ones.

In addition to concern over the loss of manufacturing jobs to imports from China, in the past few years, some policymakers have also raised political concerns about trading with China. For example, the Trump administration was concerned with what the president called China's "theft of intellectual property" from U.S. firms. The value of intellectual property to U.S. firms has more than doubled in the past 50 years. According to an article in the *Wall Street Journal*, "Foreign companies report they are routinely compelled to transfer technology to Chinese companies to do business there, in violation of Beijing's commitments" under the WTO. Although China pledged to protect the intellectual property of its trading partners, in 2023 the Biden administration asserted that China was still failing to protect the intellectual property of U.S. companies.

Political relations between the Chinese government and the governments of the United States and some Western European countries worsened during 2022 and 2023. The cause was partly the result of Chinese pressure on Taiwan, which although independent, is considered by the Chinese government to be part of China. The U.S. government was also concerned by reports of the Chinese government engaging in spying in the United States with the apparent aim of learning U.S. military and industrial secrets. In early 2023, tensions increased when the U.S. military shot down off the east coast of the United States a balloon launched by China and apparently intended to gather information on U.S. airbases and missile sites.

In response to these political problems, the U.S. government took several steps that have economic implications:

1. In May 2019, the Trump administration banned U.S. firms from doing business with Huawei, a privately owned Chinese technology firm. The administration was concerned that Huawei, under direction from the Chinese government, might place spyware on smartphones and cellular networking equipment. The Trump and Biden administrations also pressured U.S. allies, including Canada, the United Kingdom, and France, to not allow Huawei to build 5G cellphone systems in their countries. The Biden administration also imposed bans on U.S. firms exporting to China artificial intelligence software, supercomputers, and equipment for manufacturing advanced computer chips.

2. At the urging of the Biden administration, Congress passed the CHIPS and Science Act of 2022. The act included $53 billion in federal government assistance to private firms willing to construct new semiconductor factories in the United States or to expand existing factories. The act was inspired partly by the fear that if China were to invade and occupy Taiwan, U.S. firms would be cut off from semiconductor factories based there.

3. In late 2022, Congress passed legislation banning those using government smartphones from downloading the popular video app TikTok. Congress feared that the Chinese government might pressure ByteDance, the Chinese firm that owns the app, to collect data on the more than 100 million U.S. users.

4. In 2023, the Biden administration sanctioned a number of Chinese firms that it believed were spying on the United States, including six firms that had contributed to developing or manufacturing surveillance balloons such as the balloon the U.S. military shot down off the coast of North Carolina in February 2023.

Trade in goods and services between the United States and China will raise average incomes in both countries. To what extent are these economic gains from trade offset by the political issues we just discussed? This question is *normative* because it depends on how U.S policymakers evaluate the political risks that led them to take the steps that have restricted some trade between the United States and China. There is no way to quantitatively measure the risks, so we are unable to apply *positive* economic analysis to evaluate the effects of the actions U.S. policymakers have taken.

Although China has opened up its economy to trade and become more market oriented, the Chinese Communist party maintains a political dictatorship and requires Chinese firms to abide by its policies. In late 2023, it was unclear how the world trading system would cope with the political frictions that have arisen between China and the United States and its allies.

Your Turn: Test your understanding by doing related problems 3.12 and 3.13 at the end of this chapter.

Where Does Comparative Advantage Come From?

Among the main sources of comparative advantage are the following:

- **Climate and natural resources.** This source of comparative advantage is the most obvious. Because of geology, Saudi Arabia, Russia, and the United States have a comparative advantage in the production of oil. Because of climate and soil conditions, Costa Rica has a comparative advantage in the production of bananas, Ghana has a comparative advantage in the production of cocoa beans, and the United States has a comparative advantage in the production of wheat.
- **Relative abundance of labor and capital.** Some countries, such as the United States, have many highly skilled workers and a great deal of machinery. Other countries, such as China, have many unskilled workers and smaller amounts of machinery. As a result, the United States has a comparative advantage in the production of goods such as aircraft, pharmaceuticals, and computer software that require highly skilled workers or highly sophisticated machinery. China has a comparative advantage in the production of goods such as furniture, clothing, and children's toys that require unskilled workers and less sophisticated machinery. In fact, many economists believe that the surge in Chinese imports to the United States and other countries following China's admittance to the World Trade Organization (WTO) was fueled by the low cost of producing manufactured goods using low-wage, unskilled workers. These workers had become available to manufacturing firms after economic reforms allowed large numbers of workers to leave unproductive collective farms for higher-paid factory work.
- **Technology.** Broadly defined, *technology* is the processes firms use to turn inputs into goods and services. At any given time, firms in different countries do not all have access to the same technologies. In part, this difference is a result of past investments countries have made in higher education or in supporting research and development. Some countries are strong in *product technologies*, which involve the ability to develop new products. For example, firms in the United States have pioneered the development of products such as radios, televisions, computers, airliners, medical equipment, and many prescription drugs. Other countries are strong in *process technologies*, which involve the ability to improve the processes used to make existing products. For example, Japanese-based firms, such as Toyota and Honda, have succeeded by greatly improving the processes involved in designing and manufacturing automobiles.
- **External economies.** It is difficult to explain the location of some industries on the basis of climate, natural resources, the relative abundance of labor and capital, or technology. For example, why does southern California have a comparative advantage in making movies or Switzerland in making watches or New York in providing financial services? The answer is that once an industry becomes established in an area, firms located in that area gain advantages over firms located elsewhere.

The advantages include the availability of skilled workers, the opportunity to interact with other firms in the same industry, and proximity to suppliers. These advantages result in lower costs to firms located in the area. Because these lower costs result from increases in the size of the industry in an area, economists refer to them as **external economies**.

External economies Reductions in a firm's costs that result from an increase in the size of an industry.

9.4 Government Policies That Restrict International Trade

LEARNING OBJECTIVE: Analyze the economic effects of government policies that restrict international trade.

Free trade, or trade between countries without government restrictions, makes consumers better off. We can expand on this idea using the concepts of consumer surplus and producer surplus (see Chapter 4, Section 4.1). Figure 9.4 shows the market in the United States for the biofuel ethanol, which can be used as a substitute for gasoline. The figure shows the situation of autarky, where the United States does not trade with other countries. The equilibrium price of ethanol is $2.00 per gallon, and the equilibrium quantity is 6.0 billion gallons per year. The blue area represents consumer surplus, and the red area represents producer surplus.

Free trade Trade between countries that is without government restrictions.

Now suppose that the United States begins importing ethanol from Brazil and other countries that produce ethanol for $1.00 per gallon. Because the world market for ethanol is large, we will assume that the United States can buy as much ethanol as it wants without causing the *world price* of $1.00 per gallon to rise. Therefore, once imports of ethanol are allowed into the United States, U.S. firms will not be able to sell ethanol at prices higher than the world price of $1.00, and the U.S. price will become equal to the world price.

Figure 9.5 shows the result of allowing imports of ethanol into the United States. With the price lowered from $2.00 to $1.00, U.S. consumers increase their purchases from 6.0 billion gallons to 9.0 billion gallons. Equilibrium moves from point *F* to point *G*. In the new equilibrium, U.S. producers have reduced the quantity of ethanol they supply from 6.0 billion gallons to 3.0 billion gallons. Imports will equal 6.0 billion gallons, which is the difference between U.S. consumption and U.S. production.

Under autarky, consumer surplus would be area *A* in Figure 9.5. With imports, the reduction in price increases consumer surplus, so it is now equal to the sum of areas *A*,

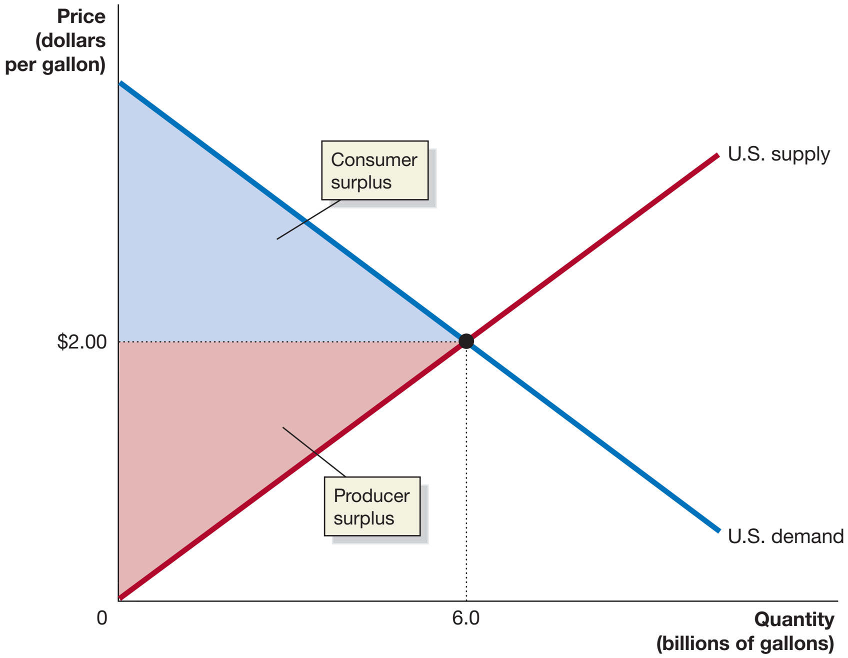


Figure 9.4

The U.S. Market for Ethanol under Autarky

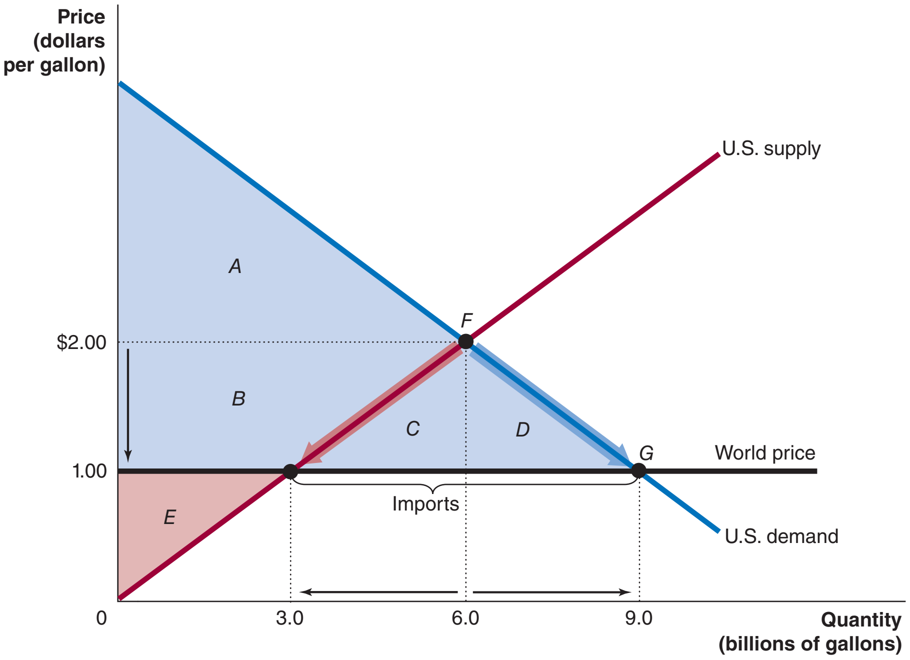
This figure shows the market for ethanol in the United States, assuming autarky, where the United States does not trade with other countries. The equilibrium price of ethanol is $2.00 per gallon, and the equilibrium quantity is 6.0 billion gallons per year. The blue area represents consumer surplus, and the red area represents producer surplus.

Figure 9.5

The Effect of Imports on the U.S. Ethanol Market

When imports are allowed into the United States, the price of ethanol falls from $2.00 to $1.00. U.S. consumers increase their purchases from 6.0 billion gallons to 9.0 billion gallons. Equilibrium moves from point *F* to point *G*. U.S. producers reduce the quantity of ethanol they supply from 6.0 billion gallons to 3.0 billion gallons. Imports equal 6.0 billion gallons, which is the difference between U.S. consumption and U.S. production. Consumer surplus equals the sum of areas *A*, *B*, *C*, and *D*. Producer surplus equals the area *E*.

	Under Autarky	With Imports
Consumer surplus	*A*	*A* + *B* + *C* + *D*
Producer surplus	*B* + *E*	*E*
Economic surplus	*A* + *B* + *E*	*A* + *B* + *C* + *D* + *E*



B, *C*, and *D*. Although the lower price increases consumer surplus, it reduces producer surplus. Under autarky, producer surplus was equal to the sum of areas *B* and *E*. With imports, it is equal to only area *E*. Recall that economic surplus equals the sum of consumer surplus and producer surplus. Moving from autarky to allowing imports increases economic surplus in the United States by an amount equal to the sum of areas *C* and *D*.

We can conclude that international trade helps consumers but hurts firms that are less efficient than foreign competitors. As a result, these firms and their workers are often strong supporters of government policies that restrict trade. These policies usually take one of two forms: (1) *tariffs* or (2) *quotas* and *voluntary export restraints*.

Tariffs

The most common interferences with trade are *tariffs*, which are taxes imposed by a government on goods imported into the country. Like any other tax, a tariff increases the cost of selling a good. Figure 9.6 shows the effect of a tariff of $0.50 per gallon on ethanol imports into the United States. The $0.50 tariff raises the price of ethanol in the United States from the world price of $1.00 per gallon to $1.50 per gallon. At this higher price, U.S. ethanol producers increase the quantity they supply from 3.0 billion gallons to 4.5 billion gallons. U.S. consumers, though, cut back their purchases of ethanol from 9.0 billion gallons to 7.5 billion gallons. Imports decline from 6.0 billion gallons (9.0 billion − 3.0 billion) to 3.0 billion gallons (7.5 billion − 4.5 billion). Equilibrium moves from point *G* to point *H*.

By raising the price of ethanol from $1.00 to $1.50, the tariff reduces consumer surplus by the sum of areas *A*, *T*, *C*, and *D*. Area *A* is the increase in producer surplus from the higher price. The government collects tariff revenue equal to the tariff of $0.50 per gallon multiplied by the 3.0 billion gallons imported. Area *T* represents the government's tariff revenue. Areas *C* and *D* represent losses to U.S. consumers that are not captured by anyone. These areas are deadweight loss and represent the decline in economic efficiency resulting from the ethanol tariff. Area *C* shows the effect of U.S. consumers being forced to buy from U.S. producers that are less efficient, and therefore manufacturing ethanol

Loss of consumer surplus	=	Increase in producer surplus	+	Government tariff revenue	+	Deadweight loss
$A + C + T + D$		A		T		$C + D$

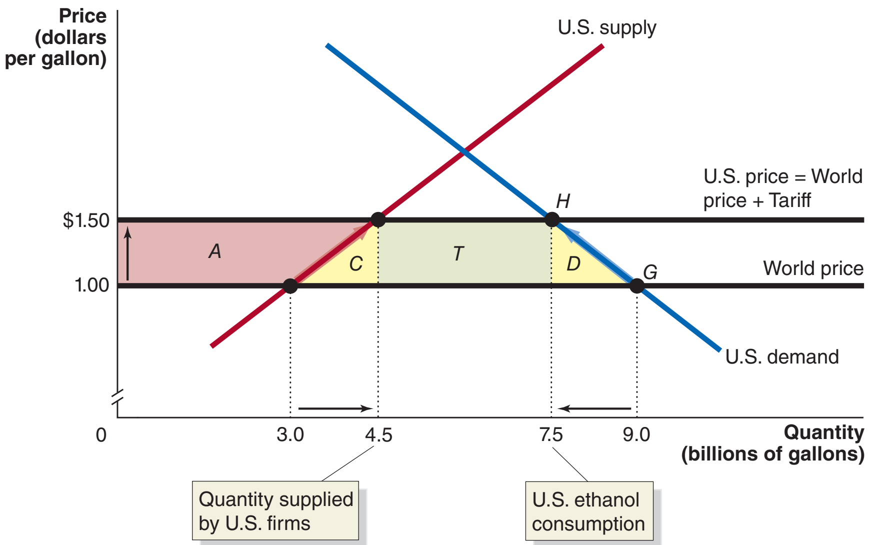


Figure 9.6

The Effects of a Tariff on Ethanol

Without a tariff, U.S. producers will sell 3.0 billion gallons of ethanol, U.S. consumers will purchase 9.0 billion gallons, and imports will be 6.0 billion gallons. The U.S. price will equal the world price of $1.00 per gallon. The $0.50-per-gallon tariff raises the price of ethanol in the United States to $1.50 per gallon, and U.S. producers increase the quantity they supply to 4.5 billion gallons. U.S. consumers reduce their purchases to 7.5 billion gallons. Equilibrium moves from point *G* to point *H*. The ethanol tariff causes a loss of consumer surplus equal to the area $A + C + T + D$. The area *A* is the increase in producer surplus due to the higher price. The area *T* is the government's tariff revenue. The areas *C* and *D* represent deadweight loss.

at a higher cost, than foreign producers. Area *D* shows the effect of U.S. consumers buying less ethanol than they would have bought at the world price. As a result of the tariff, economic surplus has been reduced by the sum of areas *C* and *D*.

We can conclude that the tariff succeeds in helping U.S. ethanol producers but hurts U.S. consumers and the efficiency of the U.S. economy.

Quotas and Voluntary Export Restraints

A **quota** is a numerical limit on the quantity of a good that can be imported, and it has an effect similar to that of a tariff. A quota is imposed by the government of the importing country. A **voluntary export restraint (VER)**—and the similar voluntary restraint agreement (VRA)—is a restriction negotiated between two countries that places a numerical limit on the quantity of a good that can be imported by one country from the other country. For example, in the 1980s, the United States and Japan negotiated a VER that limited the quantity of automobiles the United States would import from Japan. The Japanese government agreed to the VER primarily because it was afraid that if it did not, the United States would impose a tariff or quota on imports of Japanese automobiles. Quotas and VERs have similar economic effects.

Quota A numerical limit that a government imposes on the quantity of a good that can be imported into the country.

Voluntary export restraint (VER) A restriction on the quantity of a good that can be imported by one country from another country.

The main purpose of most tariffs and quotas is to reduce the foreign competition that domestic firms face. For many years, Congress has imposed a quota on sugar imports to protect U.S. sugar producers. Figure 9.7 shows the actual statistics for the U.S. sugar market in 2022. The effect of a quota is very similar to the effect of a tariff. By limiting imports, a quota forces the domestic price of a good above the world price. In this case, the sugar quota limits sugar imports to 6.8 billion pounds per year (shown by the bracket in Figure 9.7), forcing the U.S. price of sugar up to $0.36 per pound, or $0.18 higher than the world price of $0.18 per pound. The U.S. price is above the world price because the quota keeps foreign sugar producers from selling the additional sugar in the United States that would drive the U.S. price down to the world price. At a price of $0.36 per pound, U.S. producers increase the quantity of sugar they supply from the 4.6 billion pounds they would supply at the world price to 18.5 billion pounds, and U.S. consumers cut back their purchases of sugar from the 29.4 billion pounds they would purchase at the world price to the 25.3 billion pounds they are willing to purchase at the higher U.S. price. If there were no import quota, equilibrium would be at the world price (point *E*), but with the quota, equilibrium is at the U.S. price (point *F*).

Measuring the Economic Effect of the Sugar Quota

We can use the concepts of consumer surplus, producer surplus, and deadweight loss to measure the economic impact of the sugar quota. Without a sugar quota, the world price of $0.18 per pound would also be the U.S. price. In Figure 9.7, without a sugar quota, consumer surplus would equal the area above the $0.18 price line and below the demand curve. The sugar quota causes the U.S. price to rise to $0.36 and reduces consumer surplus by the area $A + B + C + D$. Without a sugar quota, producer surplus received by U.S. sugar producers would be equal to the area below the $0.18 price line and above the supply curve. The higher U.S. price resulting from the sugar quota increases the producer surplus of U.S. sugar producers by an amount equal to area *A*.

A foreign producer must have a license from the U.S. government to export sugar to the United States under the quota system. Therefore, a foreign sugar producer that is lucky enough to have an import license also benefits from the quota because it is able to sell sugar in the U.S. market at $0.36 per pound instead of $0.18 per pound. Area *B* is the gain to foreign sugar producers (assuming that foreign producers own all of the import licenses under the quota). Areas *A* and *B* represent transfers from U.S. consumers of sugar to U.S. and foreign producers of sugar. Areas *C* and *D* represent losses to U.S. consumers that are not captured by anyone. These areas are deadweight loss and represent the decline in economic efficiency resulting from the sugar quota. Area *C* shows the effect of U.S. consumers being forced to buy from U.S. producers that are less efficient

Loss of consumer surplus	=	Gain to U.S. sugar producers	+	Gain to foreign sugar producers	+	Deadweight loss
A + B + C + D		*A*		*B*		*C + D*
$4.92 billion	=	$2.08 billion	+	$1.22 billion	+	$1.62 billion

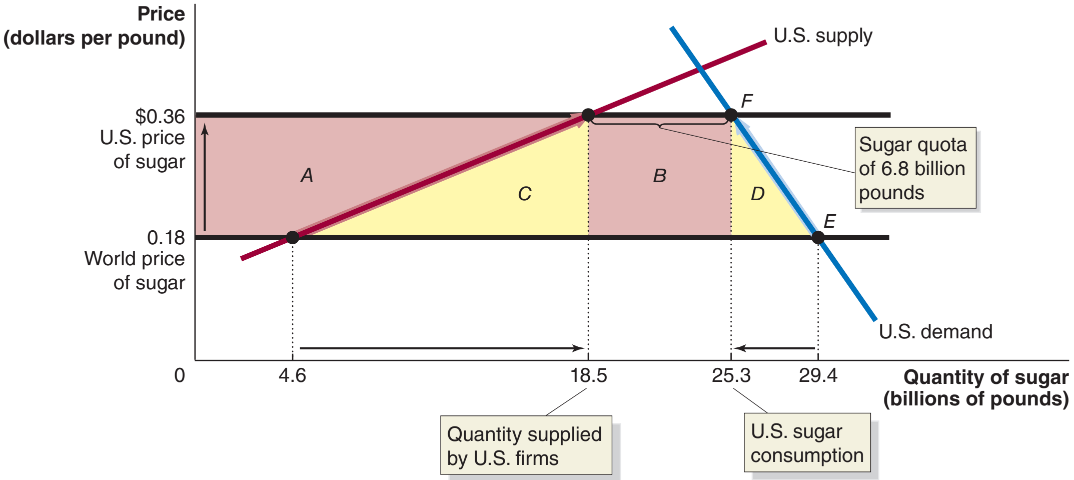


Figure 9.7 **The Economic Effect of the U.S. Sugar Quota**

Without a sugar quota, U.S. sugar producers would have sold 4.6 billion pounds of sugar, U.S. consumers would have purchased 29.4 billion pounds of sugar, and imports would have been 24.8 billion pounds (= 29.4 billion pounds − 4.6 billion pounds). The U.S. price would have equaled the world price of $0.18 per pound. Because the sugar quota limits imports to 6.8 billion pounds (the bracket in the graph), the price of sugar in the United States rises to $0.36 per pound, and U.S. producers supply 18.5 billion pounds. U.S. consumers purchase 25.3 billion pounds rather than the 29.4 billion pounds they would purchase at the world price. Without the import quota, equilibrium would be at point *E*; with the quota, equilibrium is at point *F*. The sugar quota causes a loss of consumer surplus equal to the area $A + B + C + D$. The area *A* is the gain to U.S. sugar producers. The area *B* is the gain to foreign sugar producers. The areas *C* and *D* represent deadweight loss. The total loss to U.S. consumers in 2022 was $4.92 billion.

Note: The quota amount shown in the figure includes some imports outside the quota, including imports from Mexico.

than foreign producers, and area *D* shows the effect of U.S. consumers buying less sugar than they would have bought at the world price.

Figure 9.7 provides enough information to calculate the dollar value of each of the four areas. The table in the figure shows the results of these calculations. The total loss to consumers from the sugar quota was $4.92 billion in 2022:

- About 42 percent of the loss to consumers, or $2.08 billion, was gained by U.S. sugar producers as increased producer surplus (area *A*).
- About 25 percent, or $1.22 billion, was gained by foreign sugar producers as increased producer surplus (area *B*).
- About 33 percent, or $1.62 billion, was a deadweight loss to the U.S. economy (area *C* + area *D*).

The U.S. International Trade Commission estimates that eliminating the sugar quota would result in the loss of about 3,000 jobs in the U.S. sugar industry. The cost to U.S. consumers of saving these jobs is equal to $4.92 billion/3,000, or about $1,640,000 per job each year. In fact, this cost is an underestimate because eliminating the sugar quota would result in new jobs being created, particularly in the candy industry. Over the years, several U.S. candy companies—including the makers of Life Savers and Star Brite mints—have moved factories to other countries to escape the effects of the sugar quota. Partly as a result of the sugar quota, total employment in U.S. chocolate and candy firms that use sugar as an input declined by one-quarter between 1992 and 2022.

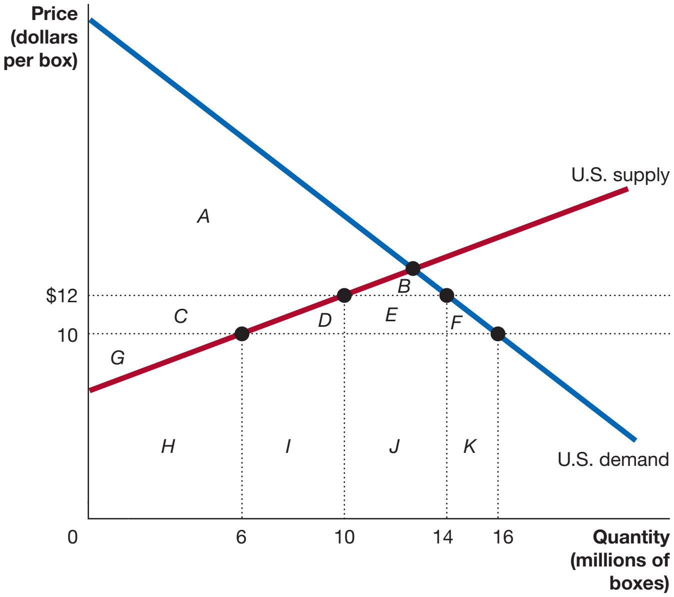
Solved Problem 9.4

Measuring the Economic Effect of a Quota

Suppose that the United States currently both produces and imports apples. The U.S. government then decides to restrict international trade in apples by imposing a quota that allows imports of only 4 million boxes of apples into the United States each year. The figure shows the results of imposing the quota.

Fill in the following table, using the prices, quantities, and letters from the figure:

	Without Quota	With Quota
World price of apples		
U.S. price of apples		
Quantity supplied by U.S. firms		
Quantity demanded by U.S. consumers		
Quantity imported		
Area of consumer surplus		
Area of domestic producer surplus		
Area of deadweight loss		



Solving the Problem

Step 1: **Review the chapter material.** This problem is about measuring the economic effects of a quota, so you may want to review the sections "Quotas and Voluntary Export Restraints" and "Measuring the Economic Effect of the Sugar Quota."

Step 2: Fill in the table. After studying Figure 9.7, you should be able to fill in the table. Remember that consumer surplus is the area below the demand curve and above the market price.

	Without Quota	With Quota
World price of apples	\$10	\$10
U.S. price of apples	\$10	\$12
Quantity supplied by U.S. firms	6 million boxes	10 million boxes
Quantity demanded by U.S. consumers	16 million boxes	14 million boxes
Quantity imported	10 million boxes	4 million boxes
Area of consumer surplus	$A + B + C + D + E + F$	$A + B$
Area of domestic producer surplus	G	$G + C$
Area of deadweight loss	No deadweight loss	$D + F$

Your Turn: For more practice, do related problem 4.11 at the end of this chapter.

The High Cost of Preserving Jobs with Tariffs and Quotas

The sugar quota is not the only government policy that imposes a high cost on U.S. consumers to save jobs at U.S. firms. The tariff on shoe imports has been estimated to cost U.S. consumers \$300,000 per year for each job saved just for women's shoes and rubber shoes. In 2009, the United States imposed a tariff on imports of Chinese tires. As a result, U.S. consumers spent about \$1.1 billion more per year on tires. The tariff saved an estimated 1,200 jobs in the U.S. tire industry, at a cost of \$900,000 per year per job saved.

Just as the sugar quota decreases the number of jobs in the candy industry, other tariffs and quotas decrease the number of jobs outside the industries immediately affected. For example, in 1991, the United States imposed tariffs on flat-panel displays used in laptop computers. The tariff was good news for U.S. producers of these displays but bad news for companies producing laptop computers. Toshiba, Sharp, and Apple all closed their U.S. laptop production facilities and moved production overseas. In fact, whenever one industry receives tariff or quota protection, other domestic industries lose jobs. The 2009 tariff on imports of Chinese tires may have cost more than 3,000 jobs in retail stores because the higher price of tires left consumers with less to spend on other goods and services.

Apply the Concept

Smoot-Hawley, the Politics of Tariffs, and the Cost of Protecting a Vanishing Industry

In the 1920s, Congress and the president responded to the financial hardship U.S. farmers faced. As a result of that response, in 2023, many U.S. businesses that import foreign-made shoes into the United States paid tariffs of 35 percent or more on the value of the shoes. Sound illogical? The politics of tariffs can certainly seem to be.

Here is the connection between farmers in the 1920s and shoes today: The 1920s were a period of rapid economic progress in the United States. The decade ushered in mass production of automobiles, the expansion of electricity use in homes and businesses, improvements in public health, a boom in housing construction, and the development of network radio and talking films. But the incomes of many farmers declined, partly because of increasing agricultural production from foreign competitors. In 1928, Republican presidential candidate Herbert Hoover promised that, if elected, he would aid farmers by raising tariffs on agricultural goods imported into the United States.

In 1929, after Hoover won the election, Congress considered a new tariff bill. During congressional negotiations, the number of products on which tariffs would be raised quickly expanded beyond agricultural products, in a process known as *logrolling*. Logrolling refers to members of Congress promising to support each other's legislation. In this case, a member of Congress from a district with many dairy farms who wanted the tariff on milk increased would seek out a member of Congress from a district with shoe factories and negotiate along these lines: "If you vote to increase tariffs on milk, I'll vote to increase tariffs on shoes." The law Congress finally passed in 1930, the *Smoot-Hawley Tariff Act*, raised tariffs to the highest level in U.S. history. As a percentage of the value of imports covered by the law, tariffs reached nearly 60 percent.

The process of logrolling can lead to very detailed and complex tariffs as members of Congress attempt to protect specific firms in their districts against competition from foreign producers. Economists Miguel Acosta of the Federal Reserve Board and Lydia Cox of Yale note that the current U.S. tariff schedule—or list of tariffs—"comprises 4,394 pages of tariffs on 19,347 varieties of goods." For example, the 2023 tariff on shoes contains hundreds of entries, many aimed at very specific types of shoes. Here are *just a few* of those entries:

Foot Locker
SALE
Foot Locker.eu

i4images premium/Alamy Stock Photo

How does the Smoot-Hawley Tariff Act of 1930 affect what you pay for your shoes today?

Type of Shoe	Tariff
Footwear designed to be worn over, or in lieu of, other footwear as a protection against water, oil, grease, or chemicals or cold or inclement weather	68.0%
Parts of footwear (including uppers whether or not attached to soles other than outer soles); removable insoles, heel cushions and similar articles; gaiters, leggings and similar articles, and parts thereof: valued over $3/pair but not over $6.50	$1.58 per pair plus 66%
Tennis shoes, basketball shoes, gym shoes, training shoes and the like, costing more than $12 per pair	35.0%
Footwear with open toes or open heels; footwear of the slip-on type, that is held to the foot without the use of laces or buckles or other fasteners, the foregoing except footwear of subheading 6402.99.20 and except footwear having a foxing or a foxing-like band wholly or almost wholly of rubber or plastics applied or molded at the sole and overlapping the upper: Having outer soles with textile materials having the greatest surface area in contact with the ground, but not taken into account under the terms of additional U.S. note 5 to this chapter	35%
House slippers valued not over $3 per pair having outer soles with textile materials having the greatest surface area in contact with the ground, but not taken into account under the terms of additional U.S. note 5 to this chapter	35%
Footwear with outer soles of rubber, plastics, leather or composition leather and uppers of textile materials: Having soles (or mid-soles, if any) of rubber or plastics which are affixed to the upper exclusively with an adhesive (any mid-soles also being affixed exclusively to one another and to the sole with an adhesive); the foregoing except footwear having uppers of vegetable fibers and having outer soles with textile materials having the greatest surface area in contact with the ground, but not taken into account under the terms of additional U.S. note 5 to this chapter	35%
Sandals and similar footwear of plastics, produced in one piece by molding	35%

Are you having trouble understanding the entries in the table? Imagine being the owner of a small business in 2023 who wants to import shoes. You will have a lot of difficulty determining what tariff to pay, given the complexity of the law.

Canada, the largest trading partner of the United States, reacted to passage of the Smoot-Hawley Tariff Act by enacting large increases in tariffs on U.S. imports. Other countries raised tariffs as well, resulting in a *trade war* that led to a sharp decrease in global trade and helped increase the severity of the Great Depression of the 1930s.

Since the end of World War II in 1945, the United States and most other countries have greatly reduced tariffs on most goods. But the United States continues to impose high tariffs on shoes more than 90 years after the passage of Smoot-Hawley.

During this time, employment in the U.S. shoe industry has fallen from 275,000 workers to fewer than 15,000, as more than 98 percent of the shoes sold in the United States are imported. The total cost to U.S. consumers from higher shoe prices due to the tariff is more than $2 billion per year. The fact that high tariffs on shoes have survived despite few shoes being manufactured in the United States anymore demonstrates how difficult it can sometimes be to remove government protection for an industry once the protection has been enacted.

One way to avoid logrolling when passing tariff laws is for Congress to give the president *fast-track authority* when negotiating trade agreements with other countries. Under fast-track authority, once the president has finished negotiating an agreement with other countries, Congress can either pass or reject the agreement but cannot change any of its provisions. Fast-track authority would have prevented the vote trading that occurred during the congressional deliberations over Smoot-Hawley. Some members of Congress have recently become skeptical about the merits of free trade, so it seems less likely that Congress will grant presidents fast-track authority in the future.

Your Turn: Test your understanding by doing related problem 4.13 at the end of this chapter.

Gains from Unilateral Elimination of Tariffs and Quotas

It is easier for policymakers to gain political support for reducing or eliminating tariffs and quotas if it is done as part of an agreement with other countries that requires those countries to eliminate some of their tariffs or quotas. But as the example of the sugar quota shows, *the U.S. economy would experience a gain in economic surplus from the elimination of tariffs and quotas even if other countries did not reduce their tariffs and quotas.*

Other Barriers to Trade

In addition to implementing tariffs and quotas, governments sometimes erect other barriers to trade, including health and safety requirements and barriers related to national security.

Health and Safety Requirements All governments require that imports meet certain health and safety requirements. Sometimes, however, governments use these requirements to shield domestic firms from foreign competition. For example, a government may impose stricter health and safety requirements on imported goods than on goods produced by domestic firms.

National Security Many governments restrict imports of certain products on national security grounds. The argument is that in time of war, a country should not be dependent on imports of critical war materials. Once again, these restrictions are sometimes used more to protect domestic companies from competition than to protect national security. For years, the U.S. government would buy military uniforms only from U.S. manufacturers, even though uniforms are not a critical war materiel. The Department of Defense gives each army recruit a voucher to purchase a pair of athletic shoes for training. New Balance has attempted to force the Department of Defense to require the vouchers be used only to purchase U.S.-made shoes. Many officials in the Department of Defense didn't see soldiers training in foreign-made running shoes as a threat to national security. President Biden justified his expansion of the Buy American program partly on national security grounds. He argued that the Covid–19 pandemic highlighted the importance of the federal government being able to buy personal protective equipment (PPE) from U.S. firms because in a pandemic, it might not be possible to obtain enough of this equipment from foreign firms. Biden also argued that U.S. firms having a reliable supply of semiconductors justified the federal government spending $53 billion to subsidize firms willing to construct new semiconductor factories in the United States, as authorized in the CHIPS and Science Act of 2022.

9.5 The Debate over Trade Policies and Globalization

LEARNING OBJECTIVE: Evaluate the debate over trade policies and globalization.

The debate over whether the U.S. government should regulate international trade has continued since the founding of the country. One particularly controversial attempt to restrict trade took place during the Great Depression of the 1930s. At that time, the United States and other countries attempted to help domestic firms by raising tariffs on imports. The United States started the process by passing the Smoot-Hawley Tariff Act in 1930, which raised average tariff rates to nearly 60 percent—the highest in U.S. history. As other countries retaliated by raising their tariffs, international trade collapsed.

By the end of World War II in 1945, government officials in the United States and Europe were looking for a way to reduce tariffs and revive international trade. To help achieve this goal, they set up the General Agreement on Tariffs and Trade (GATT) in 1948. Countries that joined the GATT agreed not to impose new tariffs or import quotas. In addition, a series of *multilateral negotiations*, called *trade rounds*, took place, in which countries agreed to reduce tariffs from the very high levels of the 1930s.

In the 1940s, most international trade was in goods, and the GATT agreement covered only goods. In the following decades, trade in services and products incorporating *intellectual property* (*IP*), such as movies and, eventually, software programs, grew in importance. Many GATT members pressed for a new agreement that would cover services and intellectual property, as well as goods. A new agreement was negotiated, and in January 1995, the GATT was replaced by the **World Trade Organization (WTO)**, headquartered in Geneva, Switzerland. In 2023, 159 countries were members of the WTO. Although in principle the WTO restricts the actions member countries can take to restrict trade, in practice it can be difficult for the WTO to enforce those rules against governments that violate them. For instance, some U.S., European, and Japanese firms have been reluctant to bring complaints to the WTO against the Chinese government for requiring the forced transfer of technology to Chinese firms because they fear that the Chinese government might bar them from operating in China.

World Trade Organization (WTO) An international organization that oversees international trade agreements.

What Explains the Opposition to Globalization?

During the years immediately after World War II, many low-income, or *developing*, countries enacted high tariffs and restricted investment by foreign companies. When these policies failed to produce much economic growth, many of these countries decided during the 1980s to become more open to foreign trade and investment. This process became known as **globalization**. Most developing countries joined the WTO and began to follow its policies.

Globalization The process of countries becoming more open to foreign trade and investment.

During the 1990s, opposition to globalization began to increase for three key reasons:

1. Some people oppose the effects they believe that the globalization process has had on developing countries.
2. Some opponents have the same motivation as the supporters of tariffs in the 1930s—to erect trade barriers to protect domestic firms from foreign competition.
3. Some opponents support globalization in principle but believe that the way the WTO has administered the international trading system favors the interests of the high-income countries at the expense of the low-income countries.

Let's look more closely at the sources of opposition to globalization.

Opposition to the Changes in Economies and Cultures Caused by Globalization Some people oppose globalization because they believe that free trade and foreign investment destroy the distinctive cultures of many countries.

As developing countries began to open their economies to trade with the United States and other high-income countries, imported food, clothing, movies, and other goods began to replace the equivalent local products. So, a teenager in Thailand might be wearing Levi's jeans and a Ralph Lauren shirt, listening to a song by Taylor Swift on his iPhone or streaming *Top Gun: Maverick* on his iPad while eating in a McDonald's restaurant. Globalization has increased the variety of products available to consumers in developing countries, but some people argue that the price—what they view as damage to local cultures—is too high.

Globalization has also allowed multinational corporations to relocate factories from high-income countries to low-income countries. New factories in Indonesia, Malaysia, Pakistan, and other countries pay much lower wages than are paid in the United States, Europe, and Japan and often do not meet the environmental or safety regulations that governments impose in high-income countries. Some factories use child labor, which is illegal in high-income countries. Some members of Congress argue that firms with factories in developing countries should pay workers wages as high as those paid in high-income countries. They also argue that those firms should abide by the health, safety, and environmental regulations that exist in high-income countries. The governments of most developing countries have resisted these proposals and make the following arguments:

1. When the currently rich countries were poor, they also lacked environmental or safety standards, and their workers were paid low wages.
2. It is easier for rich countries to afford high wages and environmental and safety regulations than it is for poor countries.
3. Many jobs that seem to have very low wages based on the standards of high-income countries are often better than the alternatives available to workers in low-income countries.

"Old-Fashioned" Protectionism The opposition to free trade based on objections to the effects of globalization is a few decades old. Another argument against free trade, called *protectionism*, has been around for centuries. **Protectionism** is the use of trade barriers to shield domestic firms from foreign competition. For as long as international trade has existed, governments have attempted to restrict it to protect domestic firms. As we saw with the analysis of the sugar quota, protectionism causes losses to consumers and eliminates jobs in the domestic industries that buy the protected product. In addition, by reducing the ability of countries to produce according to comparative advantage, protectionism reduces incomes.

Protectionism The use of trade barriers to shield domestic firms from foreign competition.

Why, then, does protectionism attract support, and why has support for protectionist policies increased recently among some policymakers in the United States? Protectionism is usually justified on the basis of one of the following arguments:

- **Saving jobs.** Supporters of protectionist policies argue that free trade reduces employment by driving domestic firms out of business. It is true that when more-efficient foreign firms drive less-efficient domestic firms out of business, jobs are lost, but jobs are also lost when more-efficient *domestic* firms drive less-efficient domestic firms out of business. In the U.S. economy, jobs are lost and new jobs are created continually. No economic study has ever found a long-term connection between the total number of jobs available in the United States as a whole and the level of tariff protection for domestic industries. But, as we discussed in the *Apply the Concept* "Who Gains and Who Loses from U.S. Trade with China, Economically . . . and Politically?" recent studies of the effects of the surge of imports from China that began in 2001 have shown that employment losses in areas most affected by imports have proven to be long-lasting. People living in some cities and towns that were home to firms that have closed because of competition from foreign imports have experienced significant hardships. But, as we have also seen, trade restrictions destroy jobs in some industries at the same time that they preserve jobs in others. The U.S. sugar quota may have saved jobs in the U.S. sugar industry, but it has also destroyed jobs in the U.S. candy industry.

- **Protecting high wages.** Some people worry that firms in high-income countries will have to pay much lower wages to compete with firms in developing countries. For the country as a whole, this fear is misplaced, however, because free trade actually raises living standards by increasing economic efficiency. When a country practices protectionism and produces goods and services it could obtain more inexpensively from other countries, it reduces its standard of living. The United States could ban imports of coffee and begin growing it domestically. But doing so would entail a very high opportunity cost because coffee could only be grown in the continental United States in greenhouses and would require large amounts of labor and equipment. The coffee would have to sell for a very high price to cover these costs. Suppose the United States did ban coffee imports. Eliminating the ban at some future time would cause U.S. coffee workers to lose their jobs, but the standard of living in the United States would rise as coffee prices declined and labor, machinery, and other resources were moved out of coffee production and into production of goods and services for which the United States has a comparative advantage. But again, recent experience indicates that while trade contributes to raising the standard of living of the country as a whole, it can lead to long-lived declines in income in areas that are most exposed to competition from imports. Such a decline appears to have taken place in areas of the Midwest and Southeast where firms were most exposed to competition from Chinese imports.
- **Protecting infant industries.** It is possible that firms in a country may have a comparative advantage in producing a good, but because the country begins production of the good later than other countries, its firms initially will have higher costs. Producing some goods and services involves substantial *learning by doing*. As workers and firms produce more of a good or service, they gain experience and become more productive. Over time, these firms will have lower costs and can charge lower prices. As the firms in the *infant industry* gain experience, they will be able to compete successfully with foreign producers. Under free trade, however, they may not get a chance to do so. The established foreign producers can sell the product at a lower price and drive domestic producers out of business before they gain enough experience to compete. To economists, the infant industry argument is the most persuasive of the protectionist arguments. It has a significant drawback, however: Tariffs eliminate the need for firms in an infant industry to become productive enough to compete with foreign firms. After World War II, the governments of many developing countries used the infant industry argument to justify high tariff rates. Unfortunately, most of their infant industries never grew up, and they continued for years as inefficient drains on their economies.
- **Protecting national security.** A country will typically not want to rely on other countries for goods that are critical to its military defense. For example, the United States would probably not want to import all its jet fighter engines from China. The definition of which goods are critical to military defense is a slippery one, however. In fact, it is rare for an industry to ask for protection without raising the issue of national security, even if its products have mainly nonmilitary uses.

Apply the Concept

Should We Use Tariffs to Slow Climate Change?

In recent years, some policymakers have proposed using tariffs for a new reason: to slow climate change. In November 2021, the United States and the European Union announced that they would explore the possibility of imposing tariffs on imports of steel from countries that have few regulations on carbon emissions from steel mills. The rationale for these climate tariffs, called *carbon border adjustment mechanisms* (CBAMs), is that in the United States and Europe, steel producers must install expensive equipment to reduce carbon emissions or must pay a tax on those emissions. These regulations raise the cost of producing steel and, therefore, the price of steel produced in Europe and the United States. As a result, U.S. and European firms that use steel, such as automobile

Cynthia Lee/Alamy Stock Photo

Will tariffs on imports from overseas steel factories like this one help reduce global warming?

companies, have an incentive to import lower-priced steel from countries that have few regulations on carbon emissions.

According to one estimate, the production of steel that is imported into the United States generates 50 percent to 100 percent more carbon dioxide emissions than does the production of domestic steel. An article in the *Wall Street Journal* quoted a report from a consulting firm that argued that "the emissions that many developed countries claim to have eliminated were 'outsourced to developing countries,' which generally have fewer resources to invest in cleaner and more advanced technology."

Critics of using tariffs as a means of slowing climate change raise three points:

1. There are other measures that countries can use to reduce their own carbon dioxide emissions, and attempts to use economic coercion to prod countries into changing policies have not generally been successful.
2. Section 232 of the Trade Expansion Act of 1962 was intended to be used only for reasons of national security, but the Trump and Biden administrations have used it more broadly to protect domestic industries. Critics fear the same outcome if climate tariffs are allowed under international agreements: Countries might use the tariffs to protect domestic industries for reasons that have nothing to do with reducing climate change. In fact, an article on barrons.com noted that the proposed agreement between the United States and the European Union to impose climate tariffs on steel imports is "aimed, according to administration officials, at countering the flood of cheap steel from China, which accounts for roughly 60% of production worldwide."
3. Some economists and policymakers fear that imposing climate tariffs may undermine the rules of the WTO, which do not authorize countries to impose tariffs for this reason. This outcome is particularly likely if some countries view the tariffs as being aimed more at protecting domestic industries than at slowing climate change. As we've seen, the WTO and its predecessor, the General Agreement on Tariffs and Trade (GATT), led to decades of multilateral negotiations that have greatly reduced tariffs. These tariff reductions have spurred a tremendous expansion in world trade, which has significantly increased incomes in the United States and most other countries—although they have also disrupted some domestic industries in those countries. If the WTO were to cease to be effective, the world might return to the situation of the 1930s and earlier, when countries used tariffs for a variety of policy reasons. The trade war of the 1930s, during which most countries raised tariff rates, led to a collapse in world trade and helped to worsen the Great Depression.

In December 2022, the European Union announced that it would begin implementing a CBAM on imports of a number of products, including aluminum, chemicals, fertilizer, and steel. It will be several years before European firms will have to begin paying tariffs on imports of the specified goods. The tariffs will vary with the amount of carbon dioxide generated in producing the goods, including carbon dioxide that utilities emit in producing the electricity that firms use to manufacture the goods. Some policymakers in the United States were disappointed that the EU had proceeded with unilaterally implementing a CBAM. The United States filed a complaint with the EU and was considering making a formal complaint to the WTO.

It wasn't clear in late 2023 whether the EU's implementation of a CBAM violates WTO regulations. It seemed unlikely that the Biden administration and Congress would follow the EU in imposing a CBAM. During a time of high inflation, it would be politically difficult to implement the required tariffs because doing so would increase the prices of domestically produced goods that use inputs such as steel and aluminum. If climate tariffs do become common, the effects on both the climate and the international trading system may be significant.

Your Turn: Test your understanding by doing related problems 5.9 and 5.10 at the end of this chapter.

Dumping

In recent years, the United States has extended protection to some domestic industries by using a provision in the WTO agreement that allows governments to impose tariffs in the case of *dumping*. **Dumping** is selling a product for a price below its cost of production. Using tariffs to offset the effects of dumping is controversial, despite being allowed under the WTO agreement.

Dumping Selling a product for a price below its cost of production.

In practice, it is difficult to determine whether foreign companies are dumping goods because the true production costs of a good are difficult for governments to calculate. As a result, the WTO allows countries to determine that dumping has occurred if a product is exported for a lower price than it sells for on the home market. There is a problem with this approach, however. Often there are good business reasons for a firm to sell a product for different prices to different consumers. For example, airlines charge business travelers higher ticket prices than they charge leisure travelers. Firms also use "loss leaders"—products that are sold below cost or even given away for free—when introducing a new product or, in the case of retailing, to attract customers who will also buy full-price products. For example, during the holiday season, Walmart sometimes offers toys at prices below what it pays to buy them from manufacturers. It's unclear why these normal business practices should be unacceptable when used in international trade.

Positive versus Normative Analysis (Once Again) and Bridges versus Walls

Economists emphasize the burden on the economy imposed by tariffs, quotas, and other government restrictions on free trade. Does it follow that these restrictions are bad? Remember that positive analysis is concerned with what *is*, while normative analysis is concerned with what *ought to be*. Measuring the effect of the sugar quota on the U.S. economy is an example of positive analysis. Asserting that the sugar quota is bad public policy and should be eliminated is normative analysis. The sugar quota—like all other interferences with trade—makes some people better off and some people worse off, and it reduces total income and consumption. Whether increasing the profits of U.S. sugar companies and the number of workers they employ justifies the costs imposed on consumers and the reduction in economic efficiency is a normative question.

Most economists do not support interferences with trade, such as the sugar quota, because they believe that markets should be as free as possible. But the opposite view is certainly intellectually respectable. It is possible for someone to understand the costs of tariffs and quotas but still believe that they are a good idea, perhaps because he or she believes unrestricted free trade would cause too much disruption to the economy.

The success of industries in getting the government to erect barriers to foreign competition depends partly on some members of the public knowing the costs of trade barriers but supporting them anyway. However, two other factors are also at work:

1. The costs that tariffs and quotas impose on consumers are large in total but relatively small per person. For example, the sugar quota imposes a total burden of $4.92 billion per year on consumers. Spread across 335 million Americans, the burden is less than $15 per person—too little for most people to worry about, even if they know the burden exists.
2. The jobs lost to foreign competition are easy to identify, but the jobs created by foreign trade are less easy to identify.

In other words, the industries that benefit from tariffs and quotas benefit a lot—for example, the sugar quota increases the profits of U.S. sugar producers by $2.08 billion per year—while each consumer loses relatively little. This concentration of benefits and widely spread burdens makes it easy to understand why members of Congress receive strong pressure from some industries to enact tariffs and quotas and relatively little pressure from the general public to reduce them.

In recent years, economists have suggested ways to reduce the negative effects of trade, particularly on workers. These policies build on the argument of the Hungarian economist Nicholas Kaldor that an economy can become more efficient if the winners from greater economic efficiency—as occurs, for instance, when barriers to international trade are reduced—compensate the losers from the move.

Policy proposals consistent with Kaldor's insight don't involve asking households and firms that have benefitted from economic change to directly compensate those who have lost. Instead, economists supporting this approach have argued that a goal of policy should be to avoid building walls against economic change, such as protectionist policies that reduce international trade, in favor of building bridges that workers adversely affected by economic change can cross to new opportunities. Such bridges would include skill development at community colleges and enhanced training and skill development within firms. Local public–private partnerships with community colleges can help workers develop skills, and firms can receive tax credits as compensation for investing in more training for their workers. Individuals likely to encounter a long spell of unemployment could be given access to personal reemployment accounts. Such an account could provide funds to support income and retraining while the individual is unemployed and provide a reemployment bonus if a new job is found within a given period.

Once again, balancing the costs and benefits of any approach to dealing with the effects of economic change is partly a matter of positive economics but also involves making normative judgments.

Continued from chapter opener

Economics in Your Life & Career

Should a Member of Congress Support a Tariff on Running Shoes?

At the beginning of the chapter, we asked you to suppose that you are an aide to a member of Congress who is considering whether to vote for a bill that would eliminate the U.S. tariff on running shoes. We asked what facts and conclusions from the economic analysis of international trade you should include in your memorandum advising the member on her vote.

The *Apply the Concept* "Smoot-Hawley, the Politics of Tariffs, and the Cost of Protecting a Vanishing Industry" notes that currently the federal government imposes a tariff of 35 percent on most imported running shoes. The cost to consumers from this tariff is estimated to be about $2 billion per year. So, one factor to include in your memo is that local businesses in the member's district that sell running shoes and local consumers who buy them would both benefit from removal of the tariff. A possibly more important factor, though, influencing the member's vote will be whether there are any shoe factories in her district. If so, it may be difficult politically for her to vote to eliminate the tariff on running shoes, even though the gain to other local businesses and to local consumers is likely to be greater in dollar terms than the losses to the owners of the shoe factory and its workers. As the *Apply the Concept* also noted, logrolling during the writing of the 1930 Smoot-Hawley Tariff Act is a reason the shoe tariff was enacted and a key reason it survives to the present. Even if there is no shoe factory in the member's district, other members of Congress who do have shoe factories in their districts may offer to trade their votes on issues that concern your member in exchange for her vote to uphold the shoe tariff. Such is the mixture of positive and normative considerations that result in tariffs and other laws!

Conclusion

There are few issues economists agree upon more than the economic benefits of free trade. But there are few political issues as controversial as government policy toward trade. Some people who would be reluctant to see the government interfere with domestic trade support interference with international trade. The damage that high tariffs inflicted on the world economy during the 1930s shows what can happen when governments around the world abandon free trade. Whether future episodes of that type can be avoided is by no means certain.

CHAPTER SUMMARY AND PROBLEMS

Key Terms

Absolute advantage, p. 304
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Comparative advantage, p. 303
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Exports, p. 301
External economies, p. 313
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9.1 The United States in the International Economy

LEARNING OBJECTIVE: Discuss the role of international trade in the U.S. economy.

Summary

International trade has been increasing in recent decades, in part because of reductions in *tariffs* and other barriers to trade. A **tariff** is a tax imposed by a government on imports. The quantity of goods and services the United States imports and exports has been continually increasing. **Imports** are goods and services bought domestically but produced in other countries. **Exports** are goods and services produced domestically and sold to other countries. Today, the United States is the second-leading exporting country in the world behind China, and about 20 percent of U.S. manufacturing jobs depend on exports.

Review Questions

1.1 Briefly explain whether the value of U.S. exports is typically larger or smaller than the value of U.S. imports. Are imports and exports now a smaller or larger fraction of GDP than they were 50 years ago?

1.2 Briefly explain whether you agree with the following statement: "International trade is more important to the U.S. economy than it is to most other economies."

Problems and Applications

1.3 If the United States were to stop trading goods and services with other countries, which U.S. industries would be likely to see their sales decline the most? Briefly explain.

1.4 Briefly explain whether you agree with the following statement: "China and Japan are more heavily involved in international trade than are most other nations. In fact, China and Japan export a larger fraction of their GDPs than do European countries such as Germany, Belgium, and France."

1.5 Why might a smaller country, such as the Netherlands, be more likely to import and export larger fractions of its GDP than would a larger country, such as China or the United States?

9.2 Comparative Advantage in International Trade

LEARNING OBJECTIVE: Explain the difference between comparative advantage and absolute advantage in international trade.

Summary

Comparative advantage is the ability of an individual, a firm, or a country to produce a good or service at the lowest **opportunity cost**. **Absolute advantage** is the ability of an individual, a firm, or a country to produce more of a good or service than competitors, using the same amount of resources. Countries trade on the basis of comparative advantage, not on the basis of absolute advantage.

Review Questions

2.1 What is the difference between absolute advantage and comparative advantage? If a country has an absolute advantage in producing a good, will it always be an exporter of that good? Briefly explain.

2.2 A World Trade Organization (WTO) publication called comparative advantage "arguably the single most powerful insight in economics." What is comparative advantage? What makes it such a powerful insight?

Problems and Applications

2.3 A book on the Roman Empire made the following observation: "Romans bought their pots from professional potters, and bought their defence from professional soldiers. From both they got a quality product—much better than if they had had to do their soldiering and potting themselves." Briefly explain what economic concept the author is illustrating in this passage. How does he know that Romans got better pots and better defense by relying on this economic concept?

2.4 Indonesia produces about 60 percent of the world's palm oil. Palm oil is used in the production of shampoo, ice cream, and chocolate. Assume that Switzerland does not produce palm oil but companies in Switzerland import palm oil from Indonesia to make chocolate. Compared to Switzerland, does Indonesia have an absolute advantage or a comparative advantage in the production of palm oil?

2.5 An article in the *Wall Street Journal* explained that despite rising national security tensions between the United States and China in 2023, trade between the two nations was rising. "China is a dominant supplier of many products [to the United States] . . . including cellphones, personal computers and solar panels." In the article, Ed Gresser, a former assistant U.S. trade representative, is quoted as stating, "China is very competitive at making things. They can provide very large quantities of products in a short amount of time."

- **a.** Can we conclude from this information that, relative to the United States, China has an absolute advantage or a comparative advantage in the production of cellphones, personal computers, and solar panels? Briefly explain, being sure to define absolute advantage and comparative advantage in your answer.
- **b.** Is it possible that both the United States and China could have a comparative advantage in the production of personal computers? If so, explain how that could be true.

2.6 James Halperin, co-chair of Heritage Auctions, was interviewed about his experiences auctioning rare coins. Noting that when the auction house first opened in the 1970s, "I used to proofread every catalog and ad, and looked at every coin we handled. But now . . . I can't think of anyone I work with today whose job I could do better than they do." Suppose Halperin actually could do a better job of proofreading catalogs and advertisements and grading coins than anyone else the auction house employs. Would it make sense for him to still perform these activities? Briefly explain.

2.7 In a column in the *Wall Street Journal*, the business historian John Steele Gordon noted that "the U.S. sells Bangladesh movies and buys its T-shirts. Both nations are better off. Both are richer because of the trade."

- **a.** For this trade to happen, what must be true of the opportunity cost of making movies in the United States compared with the opportunity cost of making them in Bangladesh?
- **b.** Can we be certain that T-shirts can be manufactured using fewer hours of work per T-shirt in Bangladesh than in the United States? Briefly explain.

2.8 The following table shows the hourly output per worker for Greece and Italy, measured as quarts of olive oil and pounds of pasta.

	Output per Hour of Work	
	Olive Oil (quarts)	Pasta (pounds)
Greece	4	2
Italy	4	8

Calculate the opportunity cost of producing olive oil and pasta in both Greece and Italy.

2.9 Using the numbers in the following table, explain which country has a comparative advantage in producing smartphones.

	Output per Hour of Work	
	Smartphones	Fitness Bracelets
Switzerland	8	10
Canada	5	3

2.10 Patrick J. Buchanan, a political commentator and former presidential candidate, argued in his book on the global economy that there is a flaw in David Ricardo's theory of comparative advantage:

> Classical free trade theory fails the test of common sense. According to Ricardo's law of comparative advantage . . . if America makes better computers and textiles than China does, but our advantage in computers is greater than our advantage in textiles, we should (1) focus on computers, (2) let China make textiles, and (3) trade U.S. computers for Chinese textiles. . . . The doctrine begs a question. If Americans are more efficient than Chinese in making clothes . . . why surrender the more efficient American industry? Why shift to a reliance on a Chinese textile industry that will take years to catch up to where American factories are today?

Do you agree with Buchanan's argument? Briefly explain.

9.3 How Countries Gain from International Trade

LEARNING OBJECTIVE: Explain how countries gain from international trade.

Summary

Autarky is a situation in which a country does not trade with other countries. The **terms of trade** is the ratio at which a country can trade its exports for imports from other countries. When a country specializes in producing goods for which it has a comparative advantage and trades for the other goods it needs, the country will have a higher level of income and consumption. We do not see complete specialization in production for three reasons: (1) Not all goods and services are traded internationally, (2) production of most goods involves increasing opportunity costs, and (3) tastes for products differ across countries. Although the population of a country as a whole benefits from trade, firms—and their workers—that are unable to compete with lower-cost foreign producers lose. Among the main sources of comparative advantage are climate and natural resources, relative abundance of labor and capital, technology, and external economies. **External economies** are reductions in a firm's costs that result from an increase in the size of an industry.

Review Questions

3.1 Briefly explain how international trade increases a country's consumption.

3.2 What is meant by a country specializing in the production of a good? Is it typical for countries to be completely specialized? Briefly explain.

3.3 What are the main sources of comparative advantage?

3.4 Does everyone gain from international trade? If not, explain which groups lose.

Problems and Applications

3.5 **[Related to Solved Problem 9.3]** The following table shows the hourly output per worker in two industries in Chile and Argentina.

	Output per Hour of Work	
	Hats	**Beer (barrels)**
Chile	8	6
Argentina	1	2

a. Explain which country has an absolute advantage in the production of hats and which country has an absolute advantage in the production of beer.

b. Explain which country has a comparative advantage in the production of hats and which country has a comparative advantage in the production of beer.

c. Suppose that Chile and Argentina currently do not trade with each other. Each has 1,000 hours of labor to use producing hats and beer, and the countries are currently producing the amounts of each good shown in the following table.

	Hats	Beer (barrels)
Chile	7,200	600
Argentina	600	800

Using this information, give a numerical example of how Chile and Argentina can both gain from trade. Assume that after trading begins, one hat can be exchanged for one barrel of beer.

3.6 **[Related to Solved Problem 9.3]** A political commentator makes the following statement:

> The idea that international trade should be based on the comparative advantage of each country is fine for rich countries like the United States and Japan. Rich countries have educated workers and large quantities of machinery and equipment. These advantages allow them to produce every product more efficiently than poor countries can. Poor countries like Kenya and Uruguay have nothing to gain from international trade based on comparative advantage.

Do you agree with this argument? Briefly explain.

3.7 The following data summarize the trade between Canada and the United States in 2020 and 2021.

	Exports of Goods and Services from the United States to Canada (billions of U.S. dollars)	Exports of Goods and Services from Canada to the United States (billions of U.S. dollars)
2020	$368.4	$367.4
2021	441.1	477.1

In 2020, the value of U.S. exports to Canada exceeded the value of Canadian exports to the United States. In 2021, the value of Canadian exports to the United States exceeded the value of U.S. exports to Canada. Can we draw any conclusions from these data about whether Canada or the United States benefited more from trade during each of these two years? Briefly explain.

3.8 An opinion column in the *Wall Street Journal* argued that "Americans enjoy comparative advantages in [service] sectors such as construction and engineering, but global trade in services is weighed down with regulatory, licensing and other barriers equivalent to tariffs of between 30% and 50% on U.S. exports." If these barriers to trade in services were reduced and U.S. exports of services increased, briefly explain whether each of the following statements would be true.

a. U.S. firms that export services would benefit.

b. Foreign consumers of U.S. exports of services would benefit.

c. Total consumption of goods and services in the United States would likely increase.

d. Total consumption in the countries buying U.S. exports of services would likely fall.

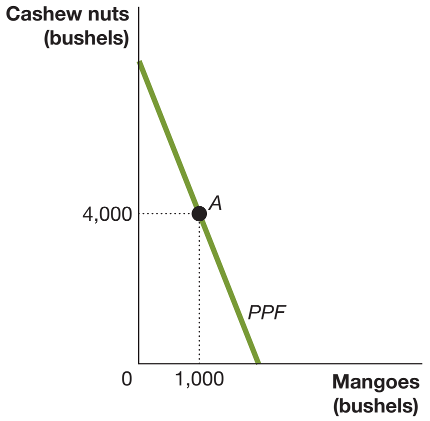
e. Foreign firms that produce construction and engineering services would likely benefit.

3.9 Hal Varian, chief economist at Google, made the following two observations about international trade:

1. Trade allows a country "to produce more with less."
2. "There is little doubt who wins [from trade] in the long run: consumers."

Briefly explain whether you agree with either or both of these observations.

3.10 Suppose the following graph shows Tanzania's production possibilities frontier (*PPF*) for cashew nuts and mangoes. Assume that the output per hour of work is 8 bushels of cashew nuts or 2 bushels of mangoes and that Tanzania has 1,000 hours of labor. Without trade, Tanzania evenly splits its labor hours between cashews and mangoes and produces and consumes at point *A*.



a. Suppose Tanzania opens trade with Kenya, and Kenya's output per hour of work is 1 bushel of cashew nuts or 1 bushel of mangoes. Having the comparative advantage, Tanzania completely specializes in cashew nuts. How many bushels of cashew nuts can Tanzania produce? Denote this point on the graph as point *B*.

b. Suppose Tanzania keeps 5,000 bushels of cashew nuts and exports the remaining 3,000 bushels. If the terms of trade are 1 bushel of mangoes for 2 bushels of cashew nuts, how many bushels of mangoes will Tanzania get in exchange? Denote on the graph the quantity of cashew nuts and mangoes that Tanzania consumes with trade and label this point as point *C*. How does point *C* with trade compare to point *A* without trade?

c. With trade, is Tanzania producing on its *PPF*? With trade, is Tanzania consuming on its *PPF*?

3.11 **[Related to the Don't Let This Happen to You]** Former President Barack Obama once described a trade agreement reached with the government of Colombia as a "'win–win' for both our countries." Is everyone in both countries likely to win from the agreement? Briefly explain.

3.12 **[Related to the Apply the Concept "Who Gains and Who Loses from U.S. Trade with China, Economically . . . and Politically?"]** An article in the *Wall Street Journal* stated that "China's treatment of American know-how has been a central issue to U.S.-China trade tensions over the past five years."

a. What does the article mean by "American know-how"?

b. How has China's treatment of American know-how been important to economic relations between the United States and China?

3.13 **[Related to the Apply the Concept "Who Gains and Who Loses from U.S. Trade with China, Economically . . . and Politically?"]** An opinion column in the *New York Times* by Donald J. Boudreaux of George Mason University is titled "Trade Is Not a Job Killer." In the column, Boudreaux notes that work by MIT economist David Autor and colleagues estimates "that trade with China from 1999 to 2011 destroyed 2.4 million jobs in the United States." If trade with China during that period, often called the "China shock," destroyed 2.4 million jobs, how can Boudreaux claim that "trade is not a job killer"?

3.14 An article in the *New York Times* discussed the number of innovative food companies, particularly those selling natural foods, that have become established in Boulder, Colorado, in recent years. According to the article, Boulder has a large number of people with experience managing food companies, lenders who know the industry, food distributors, and food processing plants. The article quoted one entrepreneur as asserting: "There's an ecosystem here that supports food entrepreneurs that you just don't find in other places. Everything you need, including a lot of experience and expertise, is right here." What advantages does being located in Boulder give to startup natural food firms? In what circumstances can natural food firms located elsewhere overcome these advantages? Are Boulder's advantages likely to persist over time?

9.4 Government Policies That Restrict International Trade

LEARNING OBJECTIVE: Analyze the economic effects of government policies that restrict international trade.

Summary

Free trade is trade between countries without government restrictions. Government policies that interfere with trade usually take the form of *tariffs, quotas,* or *voluntary export restraints.* A **quota** is a numerical limit imposed by a government on the quantity of a good that can be imported into the country. A **voluntary export restraint (VER)** is a restriction negotiated between two countries that places a numerical limit on the quantity of a good that can be imported by one country from the other country. The federal government's sugar quota costs U.S. consumers $4.92 billion per year, or about $1,640,000 per year for each job saved in the sugar industry. Saving jobs in an industry by using tariffs and quotas is often very expensive.

Review Questions

4.1 What is a tariff? What is a quota? Give an example, other than a quota, of a nontariff barrier to trade.

4.2 Who gains and who loses when a country imposes a tariff or a quota on imports of a good?

4.3 The authors of an International Monetary Fund working paper state that "consumers lose more from a tariff than producers gain, so there is a 'deadweight loss.'" Briefly explain what the authors mean by "deadweight loss."

Problems and Applications

4.4 Political commentator B. Bruce-Briggs once wrote the following in the *Wall Street Journal*: "This is not to say that the case for international free trade is invalid; it is just irrelevant. It is an 'if only everybody' . . . argument. . . . In the real world almost everybody sees benefits in economic nationalism." What do you think he means by "economic nationalism"? Do you agree that a country benefits from free trade only if every other country also practices free trade? Briefly explain.

4.5 **[Related to the Chapter Opener]** An editorial on bloomberg.com criticized President Biden's Buy American policy. The editorial argued that "the . . . problem is that protectionism sets the US at odds with its international commitments." The editorial also predicted that Europe might react "to this new US posture with big, bold 'Buy European' policies of its own."

a. What international commitments has the United States made that a Buy American policy might violate?

b. Why might it be bad for the U.S. economy if European countries responded to the Biden admiration's Buy American policy with a Buy European policy?

4.6 The United States produces beef and also imports it from other countries.

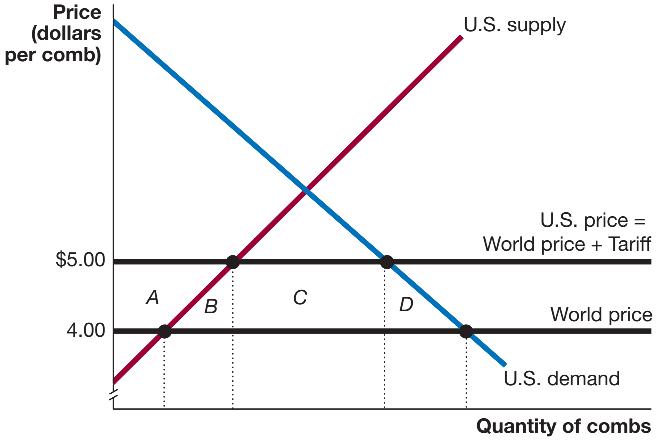
a. Draw a graph showing the demand for and supply of beef in the United States. Assume that the United States can import as much as it wants at the world price of beef without causing the world price of beef to increase. Be sure to indicate on your graph the quantity of beef imported. Assume that the world price of beef is lower than the U.S. price.

b. Now show on your graph the effect of the United States imposing a tariff on beef. Be sure to indicate on your graph the quantity of beef sold by U.S. producers before and after the tariff is imposed, the quantity of beef imported before and after the tariff, and the price of beef in the United States before and after the tariff.

c. Discuss who benefits and who loses when the United States imposes a tariff on beef.

4.7 In 2018, when the Trump administration imposed a 25 percent tariff on imports from China, executives at Walmart sent a letter to U.S. Trade Ambassador Robert Lighthizer in which they stated, "For lower-income families, a 25% tax on these items would be a serious burden on household finances." Why would the Walmart executives consider a 25 percent tariff on imports to be the equivalent of a 25 percent tax on their customers? Don't foreign firms exporting a good to the United States and not U.S. consumers buying the good have to pay the tariff? Briefly explain.

4.8 The following graph shows the effect on consumer surplus, producer surplus, government tariff revenue, and economic surplus of a tariff of $1 per unit on imports of plastic combs into the United States. Use the areas denoted by letters in the graph to answer the following questions.

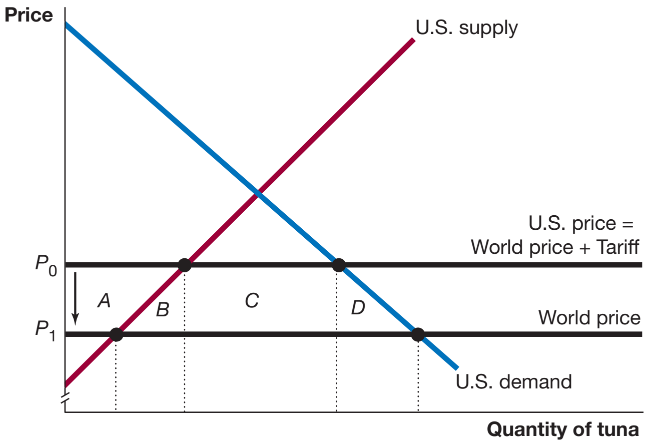


a. Which area shows the losses to U.S. consumers of buying a smaller quantity of combs than they would have bought if they could have purchased them at the world price?

b. Which area shows the losses to U.S. consumers of having to buy combs from U.S. producers who are less efficient than foreign producers?

c. Which areas show the deadweight loss to the U.S. economy as a result of the tariff on combs?

4.9 The following graph shows the situation after the U.S. government removes a tariff on imports of canned tuna.



a. Which areas show the gain in consumer surplus?

b. Which area shows the loss in producer surplus?

c. Which area shows the loss in government tariff revenue?

d. Which areas show the gain in economic surplus?

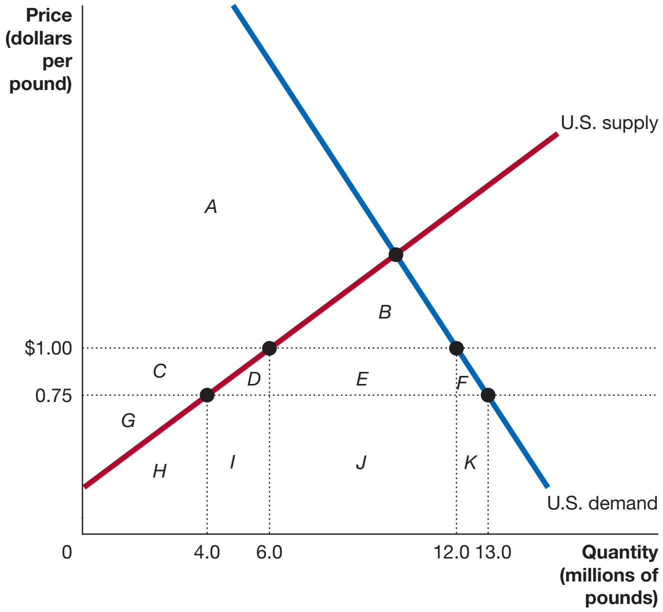
4.10 An article on bloomberg.com notes that "for candy makers who use . . . sugar, high prices prompted an exodus of manufacturing to places outside the U.S., where it's possible to buy the sweet stuff far more cheaply." The article also states that "while estimates vary, it's thought that consumers pay between $2.4 billion and $4 billion more a year [for sugar] than they would under a free-trade regime."

a. Why are sugar prices high in the United States? What does the article mean by a "free-trade regime"?

b. Why doesn't the United States have a free-trade regime for sugar?

c. Who gains and who loses as a result of the United States not having a free-trade regime for sugar?

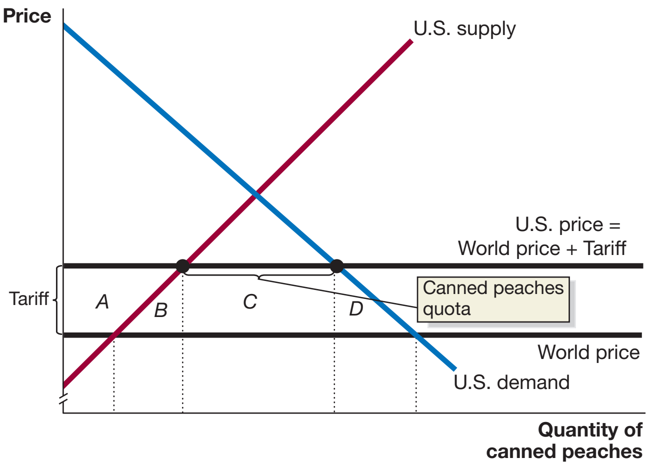
4.11 **[Related to Solved Problem 9.4]** Suppose that the United States currently both produces kumquats and imports them without any restrictions on trade. The U.S. government then decides to restrict international trade in kumquats by imposing a quota that allows imports of only 6 million pounds of kumquats into the United States each year. The following figure shows the results of imposing the quota.



Fill in the table below using the letters in the figure.

	Without Quota	With Quota
World price of kumquats		
U.S. price of kumquats		
Quantity supplied by U.S. firms		
Quantity demanded		
Quantity imported		
Area of consumer surplus		
Area of domestic producer surplus		
Area of deadweight loss		

4.12 Suppose the government is considering imposing either a tariff or a quota on canned peaches. Assume that the proposed quota has the same effect on the U.S. price of canned peaches as the proposed tariff. Use the graph to answer the following questions.



- **a.** If the government imposes a tariff, which area shows the government tariff revenue?
- **b.** If the government imposes a quota, which area shows the gain to foreign producers of canned peaches (assuming that the foreign producers own the import licenses under the quota)?
- **c.** As a consumer of peaches, would you prefer that the government impose the tariff or the quota? Briefly explain.

4.13 **[Related to the Apply the Concept "Smoot-Hawley, the Politics of Tariffs, and the Cost of Protecting a Vanishing Industry"]** Catherine Rampell is an economics writer for the *Washington Post*. In an article in 2023, she observes that "the average U.S. tariff rate on men's underwear is 11.5 percent. The average rate on women's undies, on the other hand? It's a few points higher, at 15.5 percent." She notes that women's underwear tends to be more labor intensive to produce and, therefore, it may have been more difficult decades ago for U.S. garment manufacturers to compete against imports from low-wage countries. She cites research from Miguel Acosta of the Federal Reserve Board and Lydia Cox of Yale showing that trade negotiations the United States entered into during the 1930s and 1940s often resulted in higher tariff rates on more labor-intensive products. Rampell also notes that "in the end, these protectionist policies proved ineffective at shielding U.S. companies from competition; garment manufacturing for both genders . . . almost entirely left the United States anyway." Why would the United States continue to impose tariffs on imported underwear if there are few domestic underwear producers left in the country?

4.14 **[Related to the Economics in Your Life & Career]** An article in the *Wall Street Journal* quoted a representative of the group Footwear Distributors and Retailers of America as saying, "The American footwear industry is very familiar with the negative impact tariffs have on consumer goods, having paid $1.5 billion in duties from China" in a single year. Is a tariff on imports of shoes from China likely to help or hurt employment at shoe stores? What was Congress's goal when it first imposed tariffs on shoes? Did using tariffs succeed in meeting this goal? Briefly explain.

9.5 The Debate over Trade Policies and Globalization

LEARNING OBJECTIVE: Evaluate the debate over trade policies and globalization.

Summary

The **World Trade Organization (WTO)** is an international organization that enforces trade agreements among members. The WTO has promoted **globalization**, the process of countries becoming more open to foreign trade and investment. Some critics of the WTO argue that globalization has damaged local cultures around the world. Other critics oppose the WTO because they believe in **protectionism**, which is the use of trade barriers to shield domestic firms from foreign competition. The WTO allows countries to use tariffs in cases of **dumping**, when an imported product is sold for a price below its cost of production.

Review Questions

5.1 What events led to the General Agreement on Tariffs and Trade (GATT)? Why did the WTO eventually replace the GATT?

5.2 What is globalization? Why are some people opposed to globalization? What is protectionism? Who benefits and who loses from protectionist policies? What are the main arguments people use to justify protectionism?

5.3 What is dumping? Who benefits from dumping and who loses because of dumping? What problems arise when antidumping laws are implemented?

Problems and Applications

5.4 An article on bloomberg.com quoted the *Wall Street Journal*'s observation that Congress's use of the sugar quota was an attempt to "save industries afflicted with an extreme form of prolongation of infancy." The *Wall Street Journal*'s editorial was referring to the U.S. cane sugar and beet sugar industries.

- **a.** What is an "infant industry"?
- **b.** What is the economic argument in favor of protecting infant industries?
- **c.** What does the phrase "an extreme form of prolongation of infancy" mean? How does this phrase relate to the debate over the sugar quota?

5.5 Steven Landsburg, an economist at the University of Rochester, wrote the following in an article in the *Wall Street Journal*:

> Free trade is not only about the right of American consumers to buy at the cheapest possible price; it's also about the right of foreign producers to earn a living. Steelworkers in West Virginia struggle hard to make ends meet. So do steelworkers in South Korea. To protect one at the expense of the other, solely because of where they happened to be born, is a moral outrage.

How does the U.S. government protect steelworkers in West Virginia at the expense of steelworkers in South Korea? Is Landsburg making a positive statement or a normative statement? A few days later, Tom Redburn published an article disagreeing with Landsburg. Redburn argued that caring about the welfare of people in the United States more than about the welfare of people in other countries isn't "some evil character flaw." According to Redburn, "A society that ignores the consequences of economic disruption on those among its citizens who come out at the short end of the stick is not only heartless, it also undermines its own cohesion and adaptability."

Which of the two arguments do you find most convincing?

5.6 Suppose you are explaining the benefits of free trade and someone states:

> I don't understand all the principles of comparative advantage and gains from trade. I just know that if I buy something produced in America, I create a job for an American, and if I buy something produced in Brazil, I create a job for a Brazilian.

Do you agree with this statement? When the United States imports products for which it does not have a comparative advantage, does this mean there are fewer jobs in the United States? In the example in Section 9.3 with China and the United States producing and trading smartphones and wheat, when the United States imports smartphones from China, does the number of jobs in the United States decline? Briefly explain.

5.7 Every year, the Gallup organization asks a representative sample of people in the United States whether they believe foreign trade provides "an opportunity for economic growth through increased U.S. exports" or whether they believe foreign trade represents "a threat to the economy from foreign imports." The following table shows the responses for 3 years.

	View of Foreign Trade		
Year	Favorable to Foreign Trade	Unfavorable	State of the U.S. Economy
2008	41%	52%	Deep economic recession
2019	74%	21%	Economic expansion
2022	61%	35%	Economic expansion; trade frictions with China

a. Do you believe that foreign trade helps or hurts the economy? (Be sure to define what you mean by "helps" or "hurts.")

b. Why might the general public's opinion of foreign trade be substantially different during an economic recession, when production and employment are falling, than during an economic expansion, when production and employment are increasing? Why might the percentage of the population viewing foreign trade favorably have declined between 2019 and 2022?

c. Typically, polls show that people in the United States under 30 years of age have a more favorable opinion of foreign trade than do people aged 65 and over. Why might younger people have a more favorable view of foreign trade than older people?

5.8 At one time, Eastman Kodak was the world's largest producer of photographic film, employing nearly 145,000 workers worldwide, including thousands at its headquarters in Rochester, New York. The firm eventually laid off most of those workers because its sales declined as it failed to adjust to digital photography as quickly as many of its foreign competitors. A member of Congress from Rochester described the many new firms that were now located in buildings that were formerly owned by Kodak. A *New York Times* columnist concluded that this "of course, is precisely the way globalization is supposed to work." Briefly explain what the columnist meant. Do you agree with his conclusion? Does the outcome in Rochester show that globalization is good? Briefly explain.

5.9 **[Related to the Apply the Concept "Should We Use Tariffs to Slow Climate Change?"]** An editorial on bloomberg.com comments that "Europe's border tax [CBAM] threatens to become an additional pressure on a creaking economic order. Liberal trade is already under assault from a revival of protectionist sentiment in many rich countries."

a. What does the editorial mean by a "revival of protectionist sentiment"?

b. Why might the countries of the European Union implementing a carbon border adjustment mechanism (CBAM) put pressure on a "creaking economic order"? What economic order is the editorial referring to?

5.10 **[Related to the Apply the Concept "Should We Use Tariffs to Slow Climate Change?"]** An article in the *Wall Street Journal* about the European Union's decision to implement a carbon border adjustment mechanism (CBAM) notes that: "It has rattled supply chains around the globe and angered the EU's trading partners, particularly in the developing world."

a. What are supply chains? Why might the CBAM rattle supply chains?

b. Why might developing countries be particularly concerned by the EU implementing a CBAM?

Critical Thinking Exercises

CT9.1 As we saw in this chapter, comparative advantage is an important economic concept. We often use a table and some arithmetic to explain this concept, but how might you use words to explain comparative advantage to someone not taking this course, such as a roommate, a family member, or a friend? *Hint*: You might want to explain the concept using just two people or perhaps two businesses that trade goods and services with each other, where one is more efficient in the production of all goods and services and yet both benefit from trading with each other.

CT9.2 A key part of this chapter is the section, "Where Does Comparative Advantage Come From?" which explains the main sources of comparative advantage among countries. Comparative advantage also applies to people. Describe some sources of comparative advantage between people and explain why one person might have a comparative advantage in the production of a good or service relative to another person.

CT9.3 In Chapter 3, we used the demand and supply model to understand markets. Can we also use this model to understand comparative advantage?

10 Consumer Choice and Behavioral Economics

What Caused the Plunge in Sales at Bed Bath & Beyond?

BED BATH & BEYOND
CLOSING
STORE CLOSING
EVERYTHING ON SALE!

Stephanie Keith/Bloomberg/Getty Images

Why do you shop in one store rather than another? A key priority for any successful business is to respond to consumer preferences—which can change significantly in a short period of time. But, as the experience of the retail chain Bed Bath & Beyond shows, abrupt changes in strategy sometimes turn off existing customers without attracting enough new customers to take their place.

Bed Bath & Beyond was founded in 1971 by Warren Eisenberg and Leonard Feinstein. As the name indicates, the store sold home goods, such as small appliances, towels, and sheets. The store was best known for mailing massive numbers of 20 percent off coupons, printed on thin blue cardboard and nicknamed Big Blue, to households nationwide. By 2019, the firm was operating more than 1,500 stores in the United States, yet some investors were concerned that it could be run more profitably. In March 2019, the firm's board of directors replaced the CEO with Mark Tritton, who had helped make Target stores very profitable.

Tritton changed the firm's strategy to match what he believed was a change in consumer tastes. He cut back on the number of coupons sent out, reorganized the stores to reduce the number of different products available for sale, and replaced some name-brand goods with private-label brands produced by Bed Bath & Beyond. Unfortunately, Tritton's strategy was a failure, and the firm, which had been profitable in 2018, suffered almost $1.5 billion in losses between 2019 and 2022. In June 2022, the firm's board of directors replaced Tritton with Sue Grove, who had been serving on the board. In April 2023, Bed Bath & Beyond declared bankruptcy and began closing its remaining stores. (In June 2023, Overstock.com bought the rights to Bed Bath & Beyond's name and website and Overstock renamed itself Bed Bath & Beyond.)

Why did Tritton's strategy fail? Partly because in March 2020, the effects of the Covid–19 pandemic forced the closure of many Bed Bath & Beyond stores. Unlike some other chains, Bed Bath & Beyond struggled to fulfill online orders. Covid–19 also disrupted the supply chains that Tritton was depending on to produce the private-label brands he was hoping to sell in large quantities.

But the larger problems with Tritton's strategy would likely have hurt Bed Bath & Beyond even if there had been no pandemic. Tritton thought the stores were too cluttered, and he reduced the number of products for sale. But many of the company's most loyal customers liked searching through the piles of goods on the shelves. One customer was quoted as saying, "I used to find so many things that I didn't need, that I'd end up buying anyway, like July 4th-themed corn holders." And it turned out that many Bed Bath & Beyond customers preferred national brands and switched to shopping elsewhere when Tritton replaced those brands with private-label brands. Finally, many customers were accustomed to shopping at Bed Bath & Beyond shortly after receiving a Big Blue 20 percent off coupon. Sending out fewer coupons meant those customers made fewer trips to Bed Bath & Beyond.

Clearly, it isn't easy for a firm's managers to correctly anticipate changes in consumer tastes and adapt the firm's strategy to those changes. In this chapter, we will examine how consumers make decisions about which products to buy. To analyze some of the problems Bed Bath & Beyond encountered, we will use insights from *behavioral economics*, which is the study of situations in which people make choices that do not appear to be economically rational.

Chapter Outline & Learning Objectives

10.1 Utility and Consumer Decision Making, page 338
Define utility and explain how consumers choose goods and services to maximize their utility.

10.2 Where Demand Curves Come From, page 346
Use the concept of utility to explain the law of demand.

10.3 Social Influences on Decision Making, page 349
Explain how social influences can affect consumption choices.

10.4 Behavioral Economics: Do People Make Rational Choices?, page 358
Describe the behavioral economics approach to understanding decision making.

Appendix: Using Indifference Curves and Budget Lines to Understand Consumer Behavior, page 370
Use indifference curves and budget lines to understand consumer behavior.

Economics in Your Life & Career

How Should You Price Tickets to a Concert or to a Hit Broadway Show?

Suppose you get hired by a producer of a show running at the Richard Rodgers Theatre on Broadway in New York City, or suppose you work for a concert promoter who books bands to play at the 40 Watt Club in Athens, Georgia. The producer asks your advice on what price to charge for tickets. The answer seems easy: Charge the highest price that will sell all the available tickets. Charging a lower price would seem to reduce the profit that could be earned from the show. In fact, though, charging the highest price is *not* the strategy most Broadway producers or concert promoters use. Why not? As you read this chapter, try to answer this question. You can check your answer against the one we provide at the end of this chapter.

We begin this chapter by exploring how consumers make decisions. We saw in Chapter 1 that economists usually assume that people act in a rational, self-interested way. In explaining consumer behavior, economists believe people make choices that will leave them as satisfied as possible, given their *tastes*, their *incomes*, and the *prices* of the goods and services available to them. We will see how downward-sloping demand curves result from the economic model of consumer behavior. We will also explore how, in certain situations, knowing which decision is the best one can be difficult. In such cases, economic reasoning provides a tool for consumers to improve their decision making. Finally, *experimental economics* has shown that factors such as social pressure and notions of fairness can affect consumer behavior. We will look at how businesses take these factors into account when setting prices. In the appendix to this chapter, we extend the analysis by using indifference curves and budget lines to understand consumer behavior.

10.1

Utility and Consumer Decision Making

LEARNING OBJECTIVE: Define utility and explain how consumers choose goods and services to maximize their utility.

In Chapters 3 through 7, we saw that the model of demand and supply is a powerful tool for analyzing how prices and quantities are determined. We know that, according to the *law of demand*, whenever the price of a good falls, the quantity demanded increases. In this section, we will show how the economic model of consumer behavior leads to the law of demand.

An Overview of the Economic Model of Consumer Behavior

Imagine browsing your favorite websites, trying to decide how to spend your clothing budget. If you had an unlimited budget, your decision would be easy: Just buy as much of everything as you want. Given that you have a limited budget, what do you do? Economists assume that consumers act so as to make themselves as well off as possible. Therefore, you should choose the one combination of clothes that you like best from among the combinations that you can afford. Stated more generally, the economic model of consumer behavior predicts that consumers will choose to buy the combination of goods and services that makes them as well off as possible from among all the combinations that their budgets allow them to buy.

Although this prediction may seem obvious and not particularly useful, we will see that it leads to conclusions that are useful—but not obvious.

Utility

Utility The enjoyment or satisfaction people receive from consuming goods and services.

The amount of satisfaction you receive from consuming a particular combination of goods and services depends on your tastes or preferences. There is an old saying that "there's no accounting for taste," and economists don't try to. If you buy a pair of Nike running shoes instead of a pair of Adidas shoes for the same price, you must receive more enjoyment or satisfaction from the Nikes. Economists refer to the enjoyment or satisfaction people receive from consuming goods and services as **utility**. So we can say that the goal of a consumer is to spend available income so as to maximize utility. But utility is a difficult concept to measure because there is no way of knowing exactly how much enjoyment or satisfaction someone receives from consuming a product. Similarly, it is not possible to compare utility across consumers. For example, there is no way of knowing for sure whether Jill receives more or less satisfaction than Jack from eating a slice of pizza.

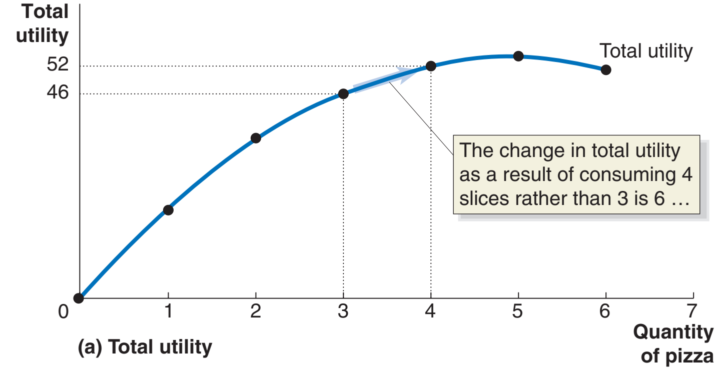
Two hundred years ago, economists hoped to measure utility in units called *utils*. The util would be an objective measure in the same way that temperature is: If it is 75 degrees in New York and 75 degrees in Los Angeles, it is just as warm in one city as in the other. These economists wanted to say that if Jack's utility from eating a slice of pizza is 10 utils and Jill's utility is 5 utils, then Jack receives exactly twice the satisfaction from eating a slice of pizza as Jill does. In fact, it is *not* possible to measure utility across people. It turns out that none of the important conclusions of the economic model of consumer behavior depend on utility being directly measurable (a point we demonstrate in the appendix to this chapter). Nevertheless, the economic model of consumer behavior is easier to understand if we assume that utility is directly measurable, like temperature.

The Principle of Diminishing Marginal Utility

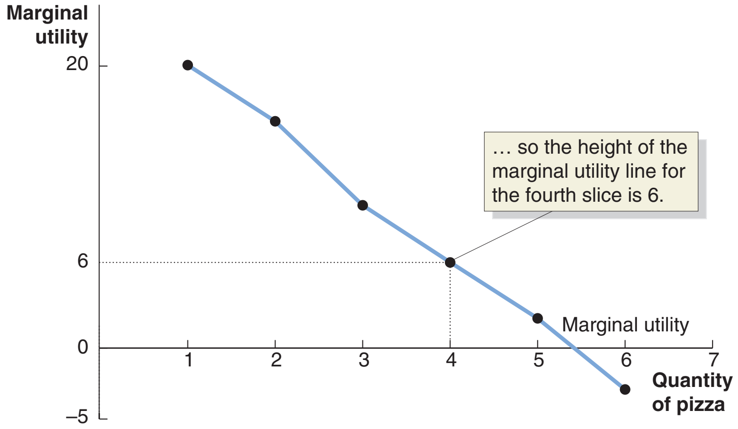
To make the model of consumer behavior more concrete, let's look at how a consumer makes decisions in a case involving just two products: pizza and Coke. To begin, consider how the utility you receive from consuming a good changes with the quantity of the good you consume. Suppose that you arrive at a Super Bowl party where the hosts are serving pizza, and you are very hungry. In this situation, you are likely to receive a lot of enjoyment, or utility, from consuming the first slice of pizza. Suppose this satisfaction is measurable and is equal to 20 units of utility, or utils. After eating the first slice, you decide to have a second slice. Because you are no longer as hungry, the satisfaction you receive from eating the second slice of pizza is less than the satisfaction you received from eating the first slice. Consuming the second slice increases your utility by only an *additional* 16 utils, which raises your *total* utility from eating the 2 slices to 36 utils. If you continue eating slices, each additional slice gives you less and less additional satisfaction.

The table in Figure 10.1 shows the relationship between the number of slices of pizza you consume while watching the Super Bowl and the amount of utility you receive.

Number of Slices	Total Utility from Eating Pizza	Marginal Utility from the Last Slice Eaten
0	0	—
1	20	20
2	36	16
3	46	10
4	52	6
5	54	2
6	51	–3



(a) Total utility



(b) Marginal utility

Figure 10.1

Total and Marginal Utility from Eating Pizza at a Super Bowl Party

The table shows that for the first 5 slices of pizza, the more you eat, the more your total satisfaction, or utility, increases. If you eat a sixth slice, you start to feel ill from eating too much pizza, and your total utility falls. Each additional slice increases your utility by less than the previous slice, so your marginal utility from each slice is less than your marginal utility from the one before. Panel (a) shows your total utility rising as you eat the first 5 slices and falling with the sixth slice. Panel (b) shows your marginal utility falling with each additional slice you eat and becoming negative with the sixth slice. The height of the marginal utility line at any quantity of pizza in panel (b) represents the change in utility as a result of consuming that additional slice. For example, the change in utility as a result of consuming 4 slices instead of 3 is 6 utils, so the height of the marginal utility line in panel (b) for the fourth slice is 6 utils.

Marginal utility (*MU*) The change in total utility a person receives from consuming one additional unit of a good or service.

The second column in the table shows the total utility you receive from eating a particular number of slices. The third column shows the additional utility, or **marginal utility (*MU*)**, you receive from consuming 1 additional slice. (Remember that in economics, *marginal* means *additional*.) For example, as you increase your consumption from 2 slices to 3 slices, your total utility increases from 36 to 46, so your marginal utility from consuming the third slice is 10 utils. As the table shows, by the time you eat the fifth slice of pizza that evening, your marginal utility is very low: only 2 utils. If you were to eat a sixth slice, you would feel slightly ill, and your marginal utility would actually be a *negative* 3 utils.

Figure 10.1 also plots the numbers from the table as graphs. Panel (a) shows how your total utility rises as you eat the first 5 slices of pizza and then falls as you eat the sixth slice. Panel (b) shows how your marginal utility declines with each additional slice you eat and finally becomes negative when you eat the sixth slice. The height of the marginal utility line at any quantity of pizza in panel (b) represents the change in utility as a result of consuming that additional slice. For example, the change in utility as a result of consuming 4 slices instead of 3 is 6 utils, so the height of the marginal utility line in panel (b) for the fourth slice is 6 utils.

Law of diminishing marginal utility The principle that consumers experience diminishing additional satisfaction as they consume more of a good or service during a given period of time.

The relationship illustrated in Figure 10.1 between consuming additional units of a product during a period of time and the marginal utility received from consuming each additional unit is called the **law of diminishing marginal utility**. For nearly every good or service, the more you consume during a period of time, the less you increase your total satisfaction from each additional unit you consume.

The Rule of Equal Marginal Utility per Dollar Spent

Budget constraint The limited amount of income available to consumers to spend on goods and services.

The key challenge for consumers is to decide how to allocate their limited incomes among all the products they want to buy. Every consumer has to make trade-offs: If you have $100 to spend on entertainment for the month, then the more movies you rent or buy online, the fewer movies you can see in the theater. Economists refer to the limited amount of income you have available to spend on goods and services as your **budget constraint**. The principle of diminishing marginal utility helps us understand how consumers can best spend their limited incomes on the products available to them.

Suppose you attend a Super Bowl party at a restaurant, and you have $10 to spend on refreshments. Pizza has a price of $2 per slice, and Coke has a price of $1 per cup. Table 10.1 shows the relationship between the amount of pizza you eat, the amount of Coke you drink, and the amount of satisfaction, or utility, you receive. The values for pizza are repeated from the table in Figure 10.1. The values for Coke also follow the principle of diminishing marginal utility.

How many slices of pizza and how many cups of Coke should you buy if you want to maximize your utility? If you did not have a budget constraint, you would buy 5 slices of pizza and 5 cups of Coke because that would give you total utility of 107 ($= 54 + 53$), which is the maximum utility you can achieve. Eating another slice of pizza or drinking another cup of Coke during the evening would lower your utility. Unfortunately, you do have a budget constraint: You have only $10 to spend. To buy 5 slices of pizza (at $2 per slice) and 5 cups of Coke (at $1 per cup), you would need $15.

Table 10.1

Total Utility and Marginal Utility from Eating Pizza and Drinking Coke

Number of Slices of Pizza	Total Utility from Eating Pizza	Marginal Utility from the Last Slice	Number of Cups of Coke	Total Utility from Drinking Coke	Marginal Utility from the Last Cup
0	0	—	0	0	—
1	20	20	1	20	20
2	36	16	2	35	15
3	46	10	3	45	10
4	52	6	4	50	5
5	54	2	5	53	3
6	51	−3	6	52	−1

To select the best way to spend your $10, remember this key economic principle: *Optimal decisions are made at the margin*. That is, most of the time economic decision makers—consumers, firms, and the government—must decide whether to do a little more of one thing or a little more of an alternative. In this case, you are choosing to consume a little more pizza or a little more Coke. Ford chooses whether to manufacture more gasoline-powered F-150s or more electric F-150 Lightnings in its River Rouge complex in Michigan. Congress and the president choose whether to spend more for research on heart disease or more to repair highways. Everyone faces a budget constraint, and everyone faces trade-offs.

The key to making the best consumption decision is to maximize utility by following the *rule of equal marginal utility per dollar spent*. As you decide how to spend your income, you should buy pizza and Coke up to the point where the last slice of pizza and the last cup of Coke purchased give you equal increases in utility *per dollar*. By using this approach, you will maximize your total utility, given your budget constraint.

It is important to remember that to follow this rule, you must equalize your marginal utility per dollar spent, *not* your marginal utility from each good. (Or, to use a familiar phrase, you want to get "the most bang for your buck.") Buying season tickets for your favorite National Football League (NFL) team or for the symphony or buying a BMW may give you a lot more satisfaction than drinking a cup of Coke, but the NFL tickets may well give you less satisfaction *per dollar spent*. To decide how many slices of pizza and cups of Coke to buy, you must convert the values for marginal utility in Table 10.1 into marginal utility per dollar. You can do this by dividing marginal utility by the price of each good, as shown in Table 10.2.

In column (3), we calculate marginal utility per dollar spent on pizza. When the price of pizza is $2 per slice, the marginal utility per dollar from eating 1 slice equals 20 divided by $2, or 10 utils per dollar. Similarly, we show in column (6) that when the price of Coke is $1 per cup, the marginal utility per dollar from drinking 1 cup of Coke equals 20 divided by $1, or 20 utils per dollar. To maximize the total utility you receive, you must make sure that the utility per dollar of pizza for the last slice of pizza is equal to the utility per dollar of Coke for the last cup. Table 10.2 shows that there are three combinations of slices of pizza and cups of Coke where marginal utility per dollar is equalized. Table 10.3 lists the combinations, the total amount of money needed to buy each combination, and the total utility received from consuming each combination.

As shown in the bottom row of Table 10.3, if you buy 4 slices of pizza, the last slice gives you 3 utils per dollar. If you buy 5 cups of Coke, the last cup also gives you 3 utils per dollar, so you have equalized your marginal utility per dollar. Unfortunately, as the third column in the table shows, to buy 4 slices and 5 cups, you would need $13, and you have only $10. The top row of the table shows that you could also equalize your marginal utility per dollar by buying 1 slice and 3 cups, but that would cost just $5, leaving you with $5 not spent. As the middle row shows, only when you buy 3 slices and 4 cups have you equalized your marginal utility per dollar and spent neither more nor less than the $10 available.

Table 10.2

Converting Marginal Utility to Marginal Utility per Dollar

(1) Number of Slices of Pizza	(2) Marginal Utility (MU_{Pizza})	(3) Marginal Utility per Dollar $\left(\frac{MU_{Pizza}}{P_{Pizza}}\right)$	(4) Cups of Coke	(5) Marginal Utility (MU_{Coke})	(6) Marginal Utility per Dollar $\left(\frac{MU_{Coke}}{P_{Coke}}\right)$
1	20	10	1	20	20
2	16	8	2	15	15
3	10	5	3	10	10
4	6	3	4	5	5
5	2	1	5	3	3
6	−3	−1.5	6	−1	−1

Table 10.3

Equalizing Marginal Utility per Dollar Spent

Combinations of Pizza and Coke with Equal Marginal Utilities per Dollar	Marginal Utility per Dollar (*MU/P*)	Total Spending	Total Utility
1 slice of pizza and 3 cups of Coke	10	$2 + $3 = $5	20 + 45 = 65
3 slices of pizza and 4 cups of Coke	5	$6 + $4 = $10	46 + 50 = 96
4 slices of pizza and 5 cups of Coke	3	$8 + $5 = $13	52 + 53 = 105

We can summarize the two conditions for maximizing utility as follows:

1. $\frac{MU_{Pizza}}{P_{Pizza}} = \frac{MU_{Coke}}{P_{Coke}}$

This condition states that the marginal utility per dollar spent must be the same for both goods.

2. Spending on pizza + Spending on Coke = Amount available to be spent

This condition is the budget constraint, which states that total spending on both goods must equal the amount available to be spent.

Of course, these conditions for maximizing utility apply not just to pizza and Coke but to any pairs of goods.

Solved Problem 10.1

Finding the Optimal Level of Consumption

The following table shows Lee's utility from consuming ice cream cones and bottles of smartwater:

Number of Ice Cream Cones	Total Utility from Ice Cream Cones	Marginal Utility from Last Cone	Number of Bottles of Smartwater	Total Utility from Bottles of Smartwater	Marginal Utility from Last Bottle
0	0	—	0	0	—
1	30	30	1	40	40
2	55	25	2	75	35
3	75	20	3	101	26
4	90	15	4	119	18
5	100	10	5	134	15
6	105	5	6	141	7

a. Lee's friend Ed inspects this table and concludes, "Lee's optimal choice would be to consume 4 ice cream cones and 5 bottles of smartwater because with that combination, his marginal utility from ice cream cones is equal to his marginal utility from smartwater." Do you agree with Ed's reasoning? Briefly explain.

b. Suppose that Lee has an unlimited budget to spend on ice cream cones and bottles of smartwater. Under these circumstances, how many ice cream cones and how many bottles of smartwater will he consume? (Assume that Lee cannot consume more than 6 ice cream cones or 6 bottles of smartwater.)

c. Suppose that Lee has $7 per week to spend on ice cream cones and bottles of smartwater. The price of an ice cream cone is $2, and the price of a bottle of smartwater is $1. If Lee wants to maximize his utility, how many ice cream cones and how many bottles of smartwater should he buy?

Solving the Problem

Step 1: Review the chapter material. This problem involves finding the optimal consumption of two goods, so you may want to review the section "The Rule of Equal Marginal Utility per Dollar Spent."

Step 2: Answer part (a) by analyzing Ed's reasoning. Ed's reasoning is incorrect. To maximize utility, Lee needs to equalize marginal utility *per dollar* for the two goods.

Step 3: Answer part (b) by determining how Lee would maximize utility with an unlimited budget. With an unlimited budget, consumers maximize utility by continuing to buy each good as long as their utility is increasing. In this case, Lee will maximize utility by buying 6 ice cream cones and 6 bottles of smartwater, given our assumption that he cannot buy more than 6 units of either good.

Step 4: Answer part (c) by determining Lee's optimal combination of ice cream cones and bottles of smartwater. Lee will maximize his utility if he spends his $7 per week so that the marginal utility of ice cream cones divided by their price is equal to the marginal utility of smartwater divided by its price. We can use the following table to solve this part of the problem:

	Ice Cream Cones		Bottles of Smartwater	
Quantity	*MU*	$\frac{MU}{P}$	*MU*	$\frac{MU}{P}$
1	30	15	40	40
2	25	12.5	35	35
3	20	10	26	26
4	15	7.5	18	18
5	10	5	15	15
6	5	2.5	7	7

Lee will maximize his utility by buying 1 ice cream cone and 5 bottles of smartwater. At this combination, the marginal utility of each good divided by its price equals 15. With this choice, he will also have spent all of his $7.

Your Turn: For more practice, do related problems 1.8 and 1.9 at the end of this chapter.

What if the Rule of Equal Marginal Utility per Dollar Does Not Hold?

The idea of achieving maximum utility by equalizing the ratio of marginal utility to price for each good you are buying can be difficult to grasp. So, let's think about it in another way: Suppose that instead of buying 3 slices of pizza and 4 cups of Coke, you buy 4 slices and 2 cups. This combination costs $10, so you would meet your budget constraint by spending all the money available to you, but would you have gotten the maximum amount of utility? No, you wouldn't have. From the information in Table 10.2, we can list the additional utility per dollar you are getting from the last slice and the last cup and the total utility from consuming 4 slices and 2 cups:

Marginal utility per dollar for the fourth slice of pizza = 3 utils per dollar
Marginal utility per dollar for the second cup of Coke = 15 utils per dollar
Total utility from 4 slices of pizza and 2 cups of Coke = 87 utils

Obviously, the marginal utilities per dollar are not equal. The last cup of Coke gave you considerably more satisfaction per dollar than did the last slice of pizza. Therefore, you can raise your total utility by buying less pizza and more Coke. Buying 1 fewer slice of pizza (3 slices rather than 4) frees up $2 that will allow you to buy 2 more cups of Coke. Eating 1 fewer slice of pizza reduces your utility by 6 utils, but drinking 2 additional cups of Coke (for a total of 4) raises your utility by 15 utils (make sure you see this), for a net increase of 9. You end up equalizing your marginal utility per dollar (5 utils per dollar for both the last slice and the last cup) and raising your total utility from 87 to 96 utils.

Don't Let This Happen to You

Equalize Marginal Utilities *per Dollar*

Harry likes to read e-books and watch movies on his tablet. The following table gives his utility from buying books and movies:

Harry's Utility from Buying Books and Movies

Quantity of Books	Total Utility from Books	Marginal Utility from Last Book	Quantity of Movies	Total Utility from Movies	Marginal Utility from Last Movie
0	0	—	0	0	—
1	50	50	1	60	60
2	85	35	2	105	45
3	110	25	3	145	40
4	130	20	4	175	30
5	140	10	5	195	20
6	145	5	6	210	15

Can you determine from this table the optimal combination of books and movies for Harry? It is very tempting to say that he should buy 4 books and 5 movies because his marginal utility from books is equal to his marginal utility from movies with that combination. In fact, we can't be sure this is the best combination because we lack critical information: Harry's budget constraint—how much he has available to spend on books and movies—and the prices of books and movies.

Let's say that Harry has $100 to spend this month, the price of an e-book is $10, and the price of an online movie is $20. (He insists on buying his movies instead of renting them!) Using the information from the first table, we can now calculate Harry's marginal utility per dollar for both goods, as shown in the following table:

Harry's Marginal Utility and Marginal Utility per Dollar from Buying Books and Movies

Quantity of Books	Marginal Utility from Last Book (MU_{Books})	Marginal Utility per Dollar $\left(\frac{MU_{Books}}{P_{Books}}\right)$	Quantity of Movies	Marginal Utility from Last Movie (MU_{Movies})	Marginal Utility per Dollar $\left(\frac{MU_{Movies}}{P_{Movies}}\right)$
1	50	5	1	60	3
2	35	3.5	2	45	2.25
3	25	2.5	3	40	2
4	20	2	4	30	1.5
5	10	1	5	20	1
6	5	0.5	6	15	0.75

Harry's marginal utility per dollar is the same for two combinations of books and movies, as shown in the following table:

Combinations of Books and Movies with Equal Marginal Utilities per Dollar	Marginal Utility per Dollar (MU/P)	Total Spending	Total Utility
5 books and 5 movies	1	\$50 + \$100 = \$150	140 + 195 = 335
4 books and 3 movies	2	\$40 + \$60 = \$100	130 + 145 = 275

Unfortunately, 5 books and 5 movies would cost Harry $150, and he has only $100. The best Harry can do is to buy 4 books and 3 movies. This combination provides him with the maximum amount of utility attainable, given his budget constraint.

The key point is the same as in Solved Problem 10.1: Consumers maximize their utility when they equalize marginal utility *per dollar* for every good they buy, *not* when they equalize marginal utility.

Your Turn: Test your understanding by doing related problem 1.11 at the end of this chapter.

The Income Effect and Substitution Effect of a Price Change

We can use the rule of equal marginal utility per dollar to analyze how consumers adjust their buying decisions when a price changes. Suppose you are back at the restaurant for the Super Bowl party, but this time the price of pizza is $1.50 per slice, rather than $2. You still have $10 to spend on pizza and Coke.

When the price of pizza was $2 per slice and the price of Coke was $1 per cup, your optimal choice was to consume 3 slices of pizza and 4 cups of Coke. The fall in the price of pizza to $1.50 per slice has two effects on the quantity of pizza you consume.

The Income Effect When the price of a good falls, you have more purchasing power. In our example, 3 slices of pizza and 4 cups of Coke now cost a total of only $8.50 instead of $10.00. An increase in purchasing power is essentially the same thing as an increase in income. The change in the quantity of pizza you will demand because of this increase in purchasing power—holding all other factors constant—is the **income effect** of the price change. Recall that if a product is a *normal good*, a consumer increases the quantity demanded as her income rises, but if a product is an *inferior good*, a consumer decreases the quantity demanded as her income rises (see Chapter 3, Section 3.1). So, if we assume that pizza is a normal good for you, the income effect of a fall in price causes you to consume more pizza. If pizza were an inferior good for you, the income effect of a fall in the price would cause you to consume less pizza.

Income effect The change in the quantity demanded of a good that results from the effect of a change in price on consumer purchasing power, holding all other factors constant.

Don't Let This Happen to You

The Income Effect Doesn't Involve an Increase in Money Income

An instructor asks a student to define the income effect and receives the following response: "The income effect refers to the fact that when a consumer's income increases, he or she will buy more of a normal good and less of an inferior good." Evaluate the student's response.

You should note that the student's response is incorrect because it mixes up two different pieces of economic analysis:

1. The income effect that results from a change in the price of a product, holding everything else constant, including the consumer's money income
2. The effect of a change in money income on a consumer's demand for a product, holding constant all other variables that affect the consumer's willingness to buy the product, including the price of the product

The instructor was asking for a definition of the first concept, but it's easy to confuse these two ideas.

Remember that the income effect analyzes the effect of a change in a consumer's purchasing power—how much more or less a consumer can buy—as a result of a price change, *holding constant the consumer's money income*. Looked at another way, the income effect explains why a price change causes a movement along a given demand curve. A change in money income causes the whole demand curve to shift to the right or to the left but does not cause a movement along the demand curve.

Your Turn: Test your understanding by doing related problem 1.12 at the end of this chapter.

The Substitution Effect When the price of pizza falls, pizza becomes cheaper *relative* to Coke, and the marginal utility per dollar for each slice of pizza you consume increases. If we hold constant the effect of the price change on your purchasing power and just focus on the effect of the price being lower relative to the price of the other good, we have isolated the **substitution effect** of the price change. The lower price of pizza relative to the price of Coke has reduced the *opportunity cost* to you of consuming pizza because now you have to give up less Coke to consume the same quantity of pizza. Therefore, the substitution effect from the fall in the price of pizza relative to the price of Coke causes you to eat more pizza and drink less Coke. In this case, both the income effect and the substitution effect of the fall in price cause you to eat more pizza. If the price of pizza had risen, both the income effect and the substitution effect would have caused you to eat less pizza. Table 10.4 summarizes the income effect and the substitution effect of a price change.

Substitution effect The change in the quantity demanded of a good that results from a change in price making the good more or less expensive relative to other goods, holding constant the effect of the price change on consumer purchasing power.

Table 10.4

Income Effect and Substitution Effect of a Price Change

When price . . .	consumer purchasing power . . .	The income effect causes quantity demanded to . . .	The substitution effect causes the opportunity cost of consuming a good to . . .
decreases,	increases.	increase for a normal good and decrease for an inferior good.	decrease when the price decreases, which causes the quantity demanded of the good to increase.
increases,	decreases.	decrease for a normal good and increase for an inferior good.	increase when the price increases, which causes the quantity demanded of the good to decrease.

Table 10.5

Adjusting Optimal Consumption to a Lower Price of Pizza

Number of Slices of Pizza	Marginal Utility from Last Slice (MU_{Pizza})	Marginal Utility per Dollar $\left(\frac{MU_{Pizza}}{P_{Pizza}}\right)$	Number of Cups of Coke	Marginal Utility from Last Cup (MU_{Coke})	Marginal Utility per Dollar $\left(\frac{MU_{Coke}}{P_{Coke}}\right)$
1	20	13.33	1	20	20
2	16	10.67	2	15	15
3	10	6.67	3	10	10
4	6	4	4	5	5
5	2	1.33	5	3	3
6	−3	−2	6	−1	−1

We can use Table 10.5 to determine the effect of the fall in the price of pizza on your optimal consumption. Table 10.5 shows the same information as Table 10.2 but with one change: The marginal utility per dollar from eating pizza has been changed to reflect the new lower price of \$1.50 per slice. Examining the table, we can see that the fall in the price of pizza will result in you eating 1 more slice of pizza, so your optimal consumption now becomes 4 slices of pizza and 4 cups of Coke. You will be spending all of your \$10, and the last dollar you spend on pizza will provide you with about the same marginal utility per dollar as the last dollar you spend on Coke. You will not be receiving exactly the same marginal utility per dollar spent on the two products. As Table 10.5 shows, the last slice of pizza gives you 4 utils per dollar, and the last cup of Coke gives you 5 utils per dollar. But this is as close as you can come to equalizing marginal utility per dollar for the two products, unless you can buy a fraction of a slice of pizza or a fraction of a cup of Coke.

10.2 Where Demand Curves Come From

LEARNING OBJECTIVE: Use the concept of utility to explain the law of demand.

According to the *law of demand*, whenever the price of a product falls, the quantity demanded increases (see Chapter 3, Section 3.1). Now that we have covered the concepts of total utility, marginal utility, and the budget constraint, we can look more closely at why the law of demand holds.

In our example of optimal consumption of pizza and Coke at the Super Bowl party, we found the following:

Price of pizza = \$2 per slices → Quantity of pizza demanded = 3 slices
Price of pizza = \$1.50 per slice → Quantity of pizza demanded = 4 slices

In panel (a) of Figure 10.2, we plot the two points showing the optimal number of slices of pizza you choose to consume at each price. In panel (b), we draw a line

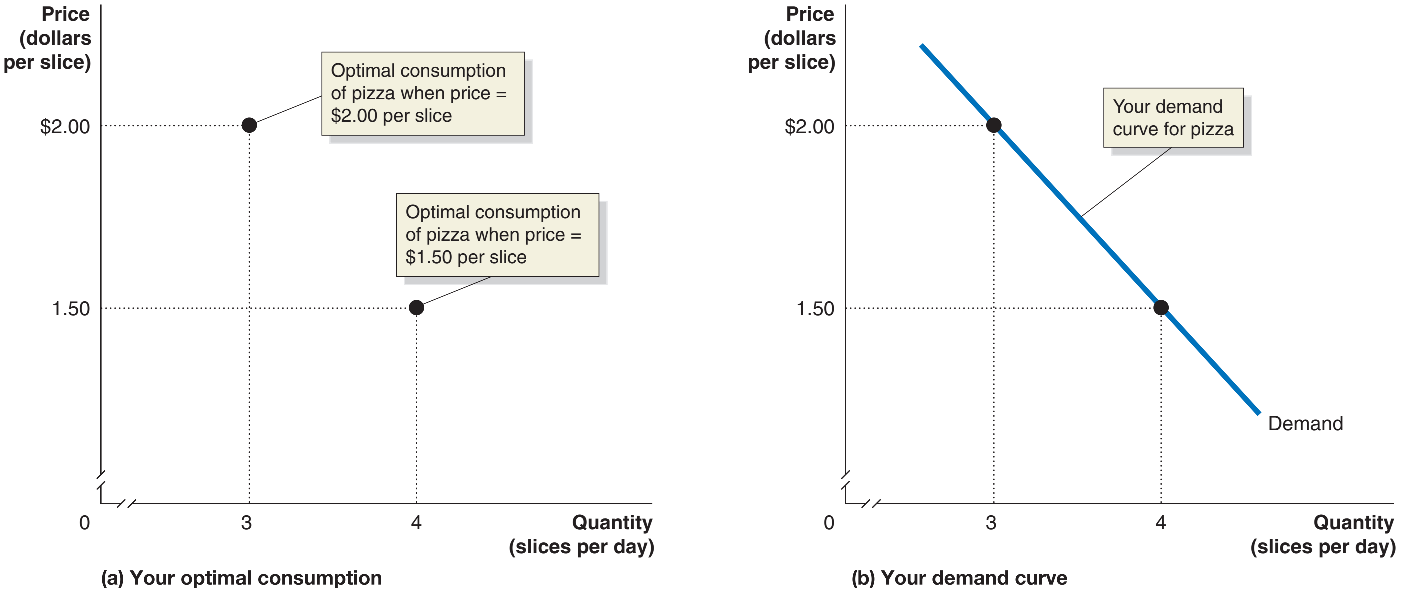


Figure 10.2 **Deriving the Demand Curve for Pizza**

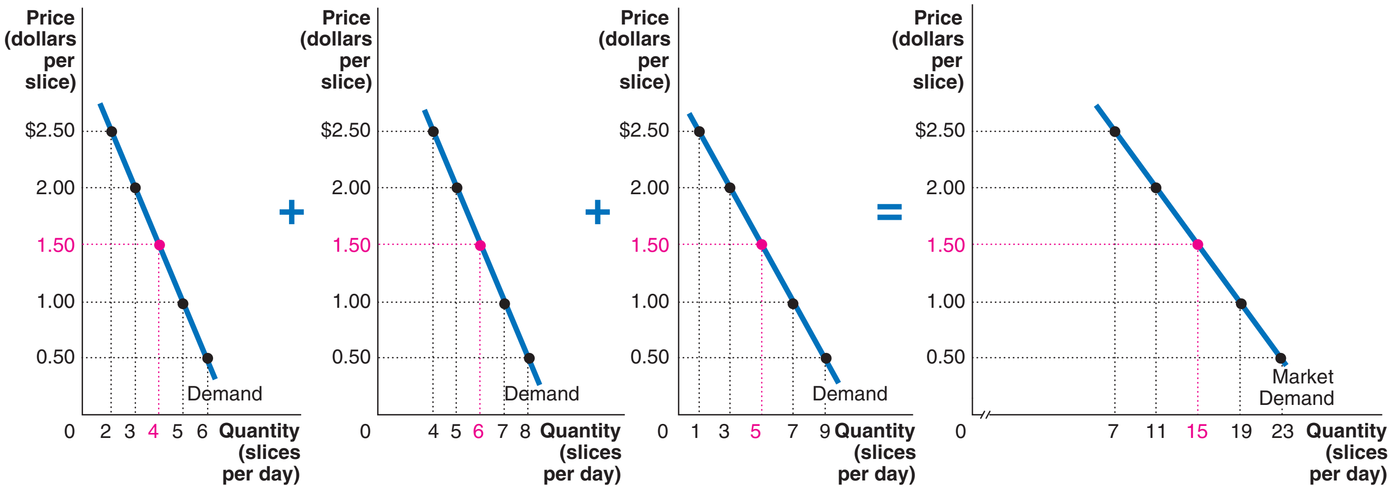
A consumer responds optimally to a fall in the price of a product by consuming more of that product. In panel (a), the price of pizza falls from $2 per slice to $1.50, and the optimal quantity of slices you consume increases from 3 to 4. When we graph this result in panel (b), we have your demand curve.

connecting the two points. This downward-sloping line represents your demand curve for pizza. We could find more points on the line by changing the price of pizza and using the information in Table 10.2 to find the new optimal number of slices of pizza you would demand at each price.

To this point in the chapter, we have been looking at an individual demand curve. Economists, though, are typically interested in *market* demand curves. We can construct the market demand curve from the individual demand curves for all the consumers in the market. To keep things simple, let's assume that there are only three consumers in the market for pizza: you, David, and Lori. The table in Figure 10.3 shows the individual demand schedules for the three consumers. Because consumers differ in their incomes and their preferences for products, we would not expect every consumer to demand the same quantity of a given product at each price. The final column lists the market demand, which is simply the sum of the quantities demanded by each of the three consumers at each price. For example, at a price of $1.50 per slice, your quantity demanded is 4 slices, David's is 6 slices, and Lori's is 5 slices. So, at a price of $1.50, a quantity of 15 slices is demanded in the market. The graphs in the figure show that we can obtain the market demand curve by adding horizontally the individual demand curves.

Remember that according to the law of demand, market demand curves always slope downward. We now know that this result holds because the income and substitution effects of a decrease in price cause consumers to increase the quantity of the good they demand. There is a complicating factor, however. As we discussed in Section 10.1, only for a normal good will the income effect lead consumers to increase the quantity of the good they demand when the price falls. For an inferior good, the income effect leads consumers to *decrease* the quantity of the good they demand. The substitution effect, in contrast, results in consumers increasing the quantity they demand of both normal and inferior goods when the price falls. So, when the price of an inferior good falls, the income effect and substitution effect work in opposite directions: The income effect causes consumers to decrease the quantity of the good they demand, while the substitution effect causes consumers to increase the quantity of the good they demand. Is it possible, then, that consumers might actually buy less of a good when the price falls? If they did, the demand curve would be upward sloping.

	Quantity (slices per day)			
Price (dollars per slice)	You	David	Lori	Market
$2.50	2	4	1	7
2.00	3	5	3	11
1.50	4	6	5	15
1.00	5	7	7	19
0.50	6	8	9	23



(a) Your demand curve **(b) David's demand curve** **(c) Lori's demand curve** **(d) Market demand curve**

Figure 10.3 **Deriving the Market Demand Curve from Individual Demand Curves**

The table shows that the total quantity demanded in a market is the sum of the quantities demanded by each buyer. We can find the market demand curve by adding horizontally the individual demand curves in panels (a), (b), and (c). For instance, at a price of $1.50, your quantity demanded is 4 slices, David's is 6 slices, and Lori's is 5 slices. Therefore, panel (d) shows that a price of $1.50 and a quantity demanded of 15 is a point on the market demand curve.

Giles Angel/Alamy Stock Photo

Rice is a Giffen good in poor parts of China.

Apply the Concept

Are There Any Upward-Sloping Demand Curves in the Real World?

For a demand curve to be upward sloping, the good would have to be an inferior good, and the income effect would have to be larger than the substitution effect. British economist Alfred Marshall first discussed the conditions for an upward-sloping demand curve in the 1890s. Marshall wrote that his friend, Sir Robert Giffen, had told him that when the price of bread rose, very poor people in British cities would actually buy more bread rather than less. Since that time, goods with upward-sloping demand curves have been called *Giffen goods.*

For more than a century, finding an actual Giffen good proved impossible. A close examination of the data showed that Giffen had been mistaken and that poor people in British cities bought *less* bread when prices rose, so their demand curves were actually downward sloping. In 2006, Robert Jensen of Yale University and Nolan Miller of the University of Illinois discovered two Giffen goods. They reasoned that to be a Giffen good, with an income effect larger than its substitution effect, a good must be inferior and make up a very large portion of consumers' budgets. Jensen and Miller knew that very poor people in the Hunan region of China spent most of their incomes on rice, while in the Gansu province, very poor people spent most of their income on wheat-based foods, such as buns and noodles. In both places, poor people ate meat when their incomes made it possible because they preferred the taste of meat, even though it did not supply as many calories as the rice or wheat they could purchase for the same price.

Jensen and Miller carried out the following experiment: In Hunan, for a five-month period, they gave a selected number of poor families coupons that would allow them to buy rice at a lower price. Families could not use the coupons for any other purpose. In Gansu, they gave a selected number of poor families coupons to buy wheat at a lower price. Jensen and Miller then observed the purchases of the families during the time they received the coupons and during the period immediately thereafter. In Hunan, during the months they received the coupons, the families bought less rice and more meat, and in Gansu, they bought less wheat and more meat. Because in Hunan, families bought less rice when the price was lower, their demand curves for rice were upward sloping. Similarly, in Gansu, families bought less wheat when the price was lower, so their demand curves for wheat were upward sloping. After more than a century of searching, economists had finally discovered examples of a Giffen good.

Your Turn: Test your understanding by doing related problems 2.9 and 2.10 at the end of this chapter.

10.3 Social Influences on Decision Making

LEARNING OBJECTIVE: Explain how social influences can affect consumption choices.

Sociologists and anthropologists have argued that social factors such as culture, customs, and religion are very important in explaining the choices people make. Economists have traditionally seen such factors as being relatively unimportant, if they take them into consideration at all. Some economists, however, believe that social factors can influence consumer choice.

For example, the late Gary Becker, a winner of the Nobel Prize in Economics, and Kevin Murphy of the University of Chicago, have argued that people seem to receive more utility from consuming goods they believe are popular:

> The utility from drugs, crime, going bowling, owning a Rolex watch, voting Democratic, dressing informally at work, or keeping a neat lawn depends on whether friends and neighbors take drugs, commit crimes, go bowling, own Rolex watches, vote Democratic, dress informally, or keep their lawns neat.

This reasoning can help explain why one restaurant is packed, while another restaurant that serves essentially the same food and has similar decor has fewer customers. Consumers decide which restaurant to go to not only on the basis of food and decor but also on the basis of the restaurant's popularity. People receive utility from being seen eating at a popular restaurant because they believe it makes them appear knowledgeable and fashionable. Whenever consumption takes place publicly, some consumers base their purchasing decisions on what other consumers are buying.

Even before the Covid–19 pandemic, department stores were losing customers because their traditional approach to selling clothing often failed to match the tastes of millennials (born between 1981 and 1996) and members of generation Z (born between 1997 and 2012). Department stores such as Macy's and J.C. Penney have typically purchased large quantities of clothes at the beginning of each season, seldom bringing in new stock during the season. The large purchases often enabled them to deal directly with manufacturers, obtaining clothing at a lower cost than smaller stores could. In recent years, though, "fashion-forward" or "fast-fashion" clothing has become more popular. Typically this clothing is made of lower-quality material, is produced in smaller quantities, and often is for sale for just a few weeks. A consumer's willingness to buy a particular piece of clothing depends not just on its characteristics but often on how many other people are wearing that type of clothing. As a result, department stores have lost a significant amount of their clothing sales to smaller stores and to websites that are better at following the latest fashion trends.

The Effects of Celebrity Endorsements

In some cases, it is not just the number of people who use a product that makes it desirable but which other people use it. If consumers believe that media stars or professional athletes use a product, demand for the product will often increase. For example, Kansas City Chiefs quarterback Patrick Mahomes is one of the biggest stars in the National Football League, so it may not be surprising that companies including State Farm Insurance, Adidas, and Bose have lined up to have him endorse their products. Mahomes makes about $20 million per year from his endorsements.

Patrick Mahomes is a great football player, but why do consumers care what products he uses? They may believe Mahomes has better information than they do about the products he endorses. The average sports fan might believe that if Mahomes endorses Adidas athletic shoes, maybe Adidas makes better athletic shoes. It seems more likely, however, that people buy products associated with celebrities like Patrick Mahomes because using these products makes them feel closer to the celebrity or because it makes them appear to be fashionable.

Network Externalities

Network externality A situation in which the usefulness of a product increases with the number of consumers who use it.

Technology can play a role in explaining why consumers buy products that many other consumers are already buying. There is a **network externality** in the consumption of a product if the usefulness of the product increases with the number of consumers who use it.

There's Strength in Numbers If you owned the only phone in the world, it would not be very useful. The usefulness of phones increases as the number of people who own them increases. Similarly, your willingness to buy an Apple iPad depends in part on the number of other people who own iPads. The more people who own iPads, the more apps firms will produce for the iPad, and the more novels, textbooks, newspapers, and magazines publishers will make available for downloading to the iPad, and, therefore, the more useful an iPad is to you.

Do Switching Costs Cause Inferior Technologies to Survive? Some economists have suggested the possibility that network externalities may have a significant downside because they might result in consumers buying products that contain inferior technologies. This outcome could occur because network externalities can create significant *switching costs* related to changing products: When a product becomes established, consumers may find switching to a new product that contains a better technology too costly. The selection of products may be *path dependent*: Because of switching costs, the technology that was first available may have advantages over better technologies that were developed later. In other words, the path along which the economy has developed in the past is important.

One possible example of path dependence and the use of an inferior technology is the QWERTY order of the letters along the top row of most computer keyboards. This order became widely used when manual typewriters were developed in the late nineteenth century. The metal keys on manual typewriters would stick together if a user typed too quickly, so the QWERTY keyboard was designed to slow down typists and minimize the problem of the keys sticking together. With computers, the problem that QWERTY was developed to solve no longer exists, so keyboards could be changed to have letters in a more efficient layout. But because the overwhelming majority of people have learned to use keyboards with the QWERTY layout, there might be significant costs to them if they had to switch, even if a new layout ultimately made them faster typists.

Other products that supposedly embodied inferior technologies are VHS video recorders—supposedly inferior to Sony Betamax recorders—and the Windows computer operating system—supposedly inferior to the Mac operating system.

Apply the Concept

Mark Zuckerberg . . . Alone in the Metaverse?

Yichuan Cao/Sipa USA/Alamy Stock Photo

Virtual reality (VR) headsets are enjoyable to use only if many other people are using it, so the product has a network externality problem.

In October 2021, Facebook founder Mark Zuckerberg did something unusual: He changed the name of the company from Facebook, Inc. to Meta Platforms, Inc. Zuckerberg said that he made the change because "over time I hope our company will be seen as a metaverse company." What is the metaverse? Definitions differ, but it typically means software programs that allow people to access either *augmented reality* (*AR*) or *virtual reality* (*VR*) images and information.

With both AR and VR, people wear headsets, goggles, or glasses to see images and information displayed. With VR, you wear goggles and remain stationary because your whole field of vision is a digital projection, so if you walk around, you run the risk of tripping over furniture or other obstacles. With AR, you wear goggles and have the freedom to walk through the physical world because the goggles display only limited amounts of information. For example, Peggy Johnson, CEO of Magic Leap, describes the AR device her firm sells this way: "You wear it over your eyes. You can actually think of it as a computer on your eyes. And you still see your physical world around you, but we place digital content very smartly in that physical world." Among other uses, Magic Leap's device can help to train a worker to use a new piece of equipment by overlaying a virtual version of the equipment over the actual piece of equipment. The virtual version would place instructions in the worker's field of view. That worker would be in the metaverse.

While Meta has been selling Oculus AR headsets, Zuckerberg has focused more on VR than on AR. An article in the *Wall Street Journal* described the VR metaverse that Zuckerberg is hoping to help build: "Eventually, the idea is that people will be able to do almost anything in the metaverse: go shopping, attend school, participate in work meetings." They would do these things while sitting at a desk or in an armchair. Meta's first significant VR product was Horizon Worlds. On Horizon, after choosing an avatar (a virtual figure that represents you), you can shop, play games, or hang out with other people. You enter Horizon by using Meta's Quest VR headset, which sells for $400 to $700, depending on the headset's configuration. Meta set a goal of having 500,000 monthly users of Horizon by the end of 2022 but ended the year with only around 200,000 active users.

Horizon's main problem is that the app is subject to large network externalities: The app is enjoyable to use only if many other people are using it. But because few people regularly use the app, many new users don't find it enjoyable and soon stop using it. According to an article in the *Wall Street Journal*, in late 2022, "Most visitors to Horizon generally don't return to the app after the first month. . . . there are rarely any girls in the Hot Girl Summer Rooftop Pool Party, and in Murder Village there is often no one to kill. Even the company's showcase worlds . . . are mostly barren of users." Reality Labs, the division of Meta in charge of Horizon, the Quest headset, and other metaverse projects, had total losses of $27 billion by the end of 2022. The losses were partly the result of Meta selling Quest headsets for a price below the cost of producing them in an attempt to get more people to use Horizon.

Zuckerberg persists in believing that the firm's future lies with the metaverse, and he continues to spend billions on metaverse projects. Investors aren't convinced that this strategy will work because, as an article on economist.com put it in early 2023: "Few people are burning to migrate to the metaverse." In March 2023, the Walt Disney Company closed its metaverse division. As investors became more skeptical of Zuckerberg's strategy, Meta's stock price declined by more than half between the fall of 2021 and early 2023. To be successful in its metaverse strategy, Meta will eventually have to attract enough buyers of its Quest headsets and users of its Horizon app to begin taking advantage of network externalities.

Your Turn: Test your understanding by doing related problem 3.6 at the end of this chapter.

Can Network Externalities Result in Market Failure? Some economists have argued that because of path dependence and switching costs, network externalities can result in *market failure,* which is the situation in which the market fails to produce the efficient level of output (see Chapter 5, Section 5.1). If network externalities result in market failure, government intervention in these markets might improve economic efficiency. Many economists are skeptical, however, that network externalities really do lead to consumers being locked into products with inferior technologies. In particular, economists Stan Leibowitz of the University of Texas, Dallas, and Stephen Margolis of North Carolina State University have argued that, in practice, the gains from using a superior technology are larger than the losses due to switching costs. After carefully studying the cases of the QWERTY keyboard, VHS video recorders, and the Windows computer operating system, they have concluded that there is no good evidence that the alternative technologies were actually superior. The implications of network externalities for economic efficiency remain controversial among economists.

Does Fairness Matter?

If people were only interested in making themselves as well off as possible in a material sense, they would not be concerned with fairness. There is a great deal of evidence, however, that people like to be treated fairly and that they usually attempt to treat others fairly, even if doing so makes them worse off financially. Tipping servers in restaurants is an example. In the United States, diners in restaurants typically add 15 to 20 percent to their food bills as tips to their servers. Tips are not *required,* but most people consider not tipping to be very unfair, unless the service has been exceptionally bad. You could argue that people leave tips not to be fair but because they are afraid that if they don't leave a tip, the next time they visit the restaurant, they will receive poor service. Studies have shown, however, that most people leave tips at restaurants even while on vacation and in other circumstances where they are unlikely to visit the restaurant again.

There are many other examples of people parting with money when they are not required to do so and when they receive nothing material in return. The most obvious example is making donations to charity. Apparently, donating money to charity or leaving tips in restaurants that they will never visit again gives people more utility than they would receive from keeping the money and spending it on themselves.

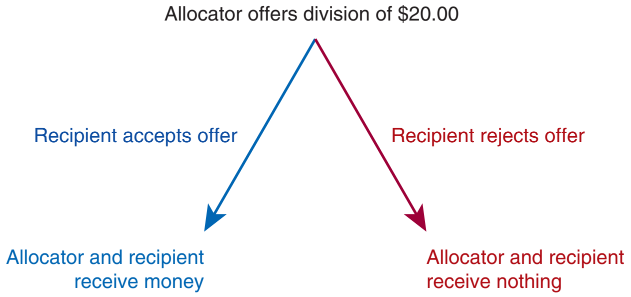
A Test of Fairness in the Economic Laboratory: The Ultimatum Game Experiment Economists have used experiments to understand the role that fairness plays in consumer decision making. *Experimental economics* has been widely used during the past two decades, and a number of experimental economics laboratories exist in the United States and Europe. Economists Maurice Allais, Reinhard Selten, and Vernon Smith were awarded the Nobel Prize in Economics in part because of their contributions to experimental economics. Experiments make it possible to focus on a single aspect of consumer behavior. The *ultimatum game* is an experiment that tests whether fairness is important in consumer decision making.

Figure 10.4 illustrates the ultimatum game. A group of volunteers—often college students—are divided into pairs. One member of each pair is the "allocator," and the other member of the pair is the "recipient." The allocator is given an amount of money, say $20, and decides how much each member of the pair will get. There are no restrictions on how the allocator divides up the money. The allocator could keep it all, give it

Figure 10.4

The Ultimatum Game

In the ultimatum game, an allocator divides an amount of money with a recipient. If the recipient rejects the division of money, neither player receives anything. In experiments, most recipients would rather receive nothing than receive what they believe to be an unfair division of the money.


Allocator offers division of $20.00
Recipient accepts offer
Recipient rejects offer
Allocator and recipient receive money
Allocator and recipient receive nothing

all to the recipient, or anything in between. The recipient must then decide whether to accept the allocation or reject it. If the recipient decides to accept the allocation, each member of the pair gets to keep his or her share. If the recipient decides to reject the allocation, both members of the pair receive nothing.

If neither the allocator nor the recipient cares about fairness, optimal play in the ultimatum game is straightforward: The allocator should propose a division of the money in which the allocator receives $19.99 and the recipient receives $0.01. The allocator has maximized his or her gain. The recipient should accept the division because the alternative is to reject it and receive nothing at all. Even a penny is better than nothing, right? In fact, when the ultimatum game experiment is carried out, both allocators and recipients act as if fairness is important. Allocators usually offer recipients at least a 40 percent share of the money, and recipients almost always reject offers of less than a 10 percent share.

Allocators may offer recipients more than a negligible amount not because the allocators value fairness but because they believe that recipients do. This possibility was tested in an experiment known as the *dictator game* carried out by Daniel Kahneman (a psychologist who shared the 2002 Nobel Prize in Economics), Jack Knetsch, and 2017 Economics Nobel Laureate Richard Thaler, using students at Cornell University. In this experiment, the allocators were given only two possible divisions of $20: either $18 for the allocator and $2 for the recipient or an even division of $10 for the allocator and $10 for the recipient. One important difference from the ultimatum game was that *the recipient was not allowed to reject the division*. Of the 161 allocators, 122 chose the even division of the $20. Because there was no possibility of the $18/$2 split being rejected, the allocators must have chosen the even split because they valued acting fairly.

Apparently, most people value fairness enough that they will refuse to participate in transactions they consider unfair, even if they are worse off financially as a result.

Are the Results of Economic Experiments Reliable? Economists have conducted the ultimatum game and the dictator game many times in different countries. Therefore, most economists believe that the results of the game provide strong evidence that people value fairness. But some economists argue that because the experimental situation is artificial, results may not hold up in the real world. Although an allocator in the dictator game gives money to the other player, whose identity is not known to the allocator, in the real world, people rarely just hand money to strangers. So, it is possible that the fairness observed in the experiments may be the result of people wanting to avoid appearing selfish rather than people valuing fairness. For instance, in the ultimatum game, anyone who kept $19.99 and gave the other person only $0.01 might be afraid of appearing selfish in the eyes of the economist conducting the experiment. Particularly because the dollar amounts in the experiment are small, wanting to please the person conducting the experiment may be the main motive behind the choices made.

Some experimental evidence indicates that when the amount being divided is large, recipients in ultimatum games will accept even very uneven divisions. Steffen Andersen of the Copenhagen Business School and colleagues conducted the dictator game with poor villagers in India, whose average daily wage was about 100 rupees. In their experiments, the amounts to be divided varied from 20 rupees to 20,000 rupees. They found that the larger the amount at stake, the smaller the share the allocator offered the recipient. When the amount was 20,000 rupees—or the equivalent of about 200 days' pay—allocators offered recipients, on average, a share of about 12 percent. Despite being offered this low share, only 4 percent of recipients rejected the offer. The results indicate that, as economists might expect, the more costly it is to a recipient to reject an unfair offer, the less likely the recipient is to do so.

This recent research does not completely reverse the usual interpretation of the results of the ultimatum and dictator games. However, the research does show that the results of the games are not as clear-cut as many economists had thought.

Business Implications of Fairness If consumers value fairness, how does this affect firms? One consequence is that firms will sometimes not raise prices of goods and services, even when there is a large increase in demand, because they are afraid their customers will consider the price increases unfair and may buy elsewhere.

Consider three examples where it seems that businesses could increase their profits by raising prices:

- When country singer Garth Brooks played a concert at Minneapolis's U.S. Bank Stadium, the tickets were priced at $75 each. But demand for the tickets was so high that 50,000 people were still waiting online to buy them after they had sold out. Why didn't Brooks or the concert promoter charge more than $75 for the tickets?
- Each year, many more people would like to buy tickets to see the Super Bowl than there are tickets for them to buy at the price the National Football League (NFL) charges. Why doesn't the NFL raise prices?
- When the restaurant Next opened in Chicago, it used a unique approach to pricing. The restaurant sold tickets that entitled the buyer to a dinner, including drinks and tip. The restaurant sold the tickets for $45 to $75, depending on the dinner chosen. The tickets were resold online for prices from $500 to $3,000. Why didn't Next increase its ticket prices?

In each of these cases, it appears that a firm could increase its profit by raising prices. The seller would be selling the same quantity—of seats at a concert or in a football stadium, or meals in a restaurant—at a higher price, so profit should increase. Economists have provided two explanations for why firms sometimes *do not* raise prices in these situations:

1. **Consuming goods together.** Gary Becker suggested that the products involved—concerts, football games, or restaurant meals—are all products that buyers consume together with other buyers. In those situations, the amount consumers wish to buy may be related to how much of the product other people are consuming. People like to consume, and be seen consuming, popular products—ones where the quantity demanded appears to be much greater than the quantity supplied. If rock bands, the NFL, and popular restaurants increased their prices enough to equate the quantity of tickets demanded with the quantity supplied, they might find that they had also eliminated their popularity.

2. **Perception of fairness.** In surveys of consumers, Daniel Kahneman, Jack Knetsch, and Richard Thaler found that most people considered it fair for firms to raise their prices following an increase in costs but unfair to raise prices following an increase in demand. For example, these researchers conducted a survey in which people were asked their opinion of the following situation: "A hardware store has been selling snow shovels for $15. The morning after a large snowstorm, the store raises the price to $20." Eighty-two percent of respondents said that they considered the hardware store's actions to be unfair. Kahneman, Knetsch, and Thaler concluded that firms may sometimes not raise their prices even when the quantity demanded of their product is greater than the quantity supplied out of fear that, in the long run, they will lose customers who believe the price increases were unfair.

These two explanations for why firms don't always raise prices to a level that would equate the quantity demanded with the quantity supplied share the same basic idea: Sometimes firms will give up some profit in the short run to keep their customers happy and increase their profit in the long run.

Apply the Concept

Taylor Swift Tries to Please Fans *and* Make Money

For as long as there have been ticketed sporting events, concerts, and plays, there have been *ticket scalpers*—people who buy tickets at their original price and then resell them at a higher price. In ancient Rome, the Roman Colosseum seated 50,000 spectators for gladiatorial contests and other events. Although the Roman government distributed tickets for free, enterprising people would accumulate as many as they could and resell them for cash or goods. Before the internet, scalpers typically waited outside a sports arena, concert hall, or theater, scanning the crowd for people who seemed as if they needed tickets, hoping to make a deal for cash on the spot. At one time, scalping tickets was illegal in many cities and states, so scalpers needed to avoid police officers stationed outside events.

Today, most ticket reselling has moved online, to popular sites such as StubHub and SeatGeek, and most local governments have repealed their bans on scalping. These sites have provided an easy way for people who find they can no longer attend an event to resell their tickets. But professional ticket resellers have also used the sites to boost their profits. Using sophisticated software programs called "ticket bots," professional resellers buy large blocks of tickets the moment they are available for sale. The professional resellers then list the tickets on StubHub or other sites at several times their face value. Although use of ticket bots is illegal in most states, theaters and other venues can have difficulty identifying whether a particular purchase has been made by a human or a bot.

Javier Vicencio/Eyepix/NurPhoto SRL/Alamy Stock Photo

Taylor Swift broke attendance and gross sales records during her 2023 The Eras Tour, thanks in part to a new system of selling tickets.

As she prepared for her 2018 Reputation Stadium Tour, Taylor Swift faced a dilemma: If she charged ticket prices high enough so that the quantity of tickets demanded equaled the quantity of seats in each concert venue, her most loyal fans might be upset. The result could damage her reputation, reducing her future music sales. But if she priced her tickets as low as she had in 2015 for her 1989 World Tour, ticket scalpers would buy them up and resell them for much higher prices. Scalpers would likely end up earning a bigger profit from her tour than she did.

Swift eventually decided to use a system of selling tickets that she hoped would keep her fans happy while reducing the number of concert tickets in the hands of scalpers. Months before the tour began, fans were asked to register as "verified fans" on the Ticketmaster online ticket-buying site. Half of the concert tickets were reserved for sale to only those fans. By buying Swift's *Reputation* album or other merchandise from her website and by watching her videos, verified fans became eligible to buy tickets at a 25 percent discount during a six-day period before tickets went on general sale. Only people who Ticketmaster's software determined actually qualified as verified fans received the code necessary to buy tickets at a discount.

The new approach to ticket selling was a financial success, and Swift set a record for the highest-grossing concert tour in U.S. history. Swift used a similar approach in 2023 for her The Eras Tour of 20 U.S. cities, setting aside even more tickets to be sold to verified fans. Only about 10 percent of the tickets for each of her performances were made available to the general public. The tickets purchased by verified fans had an average price of $215. Ticketmaster indicated that only about 5 percent of the tickets sold to verified fans ended up being resold. In contrast, many of the seats sold to the general public were resold. Because demand for tickets to the concerts was so great and relatively few tickets were available, tickets were sold on the resale market for prices up to $58,000. (Ticketmaster's handling of the sale of tickets for The Eras Tour resulted in Swift and many of her fans criticizing the site. Ticketmaster's decision to sell all the tickets to verified fans on a single day overwhelmed the site's servers. Fans experienced very long waits to buy tickets, and some were unable to buy tickets. Some members of Congress argued that Ticketmaster's poor performance was due to the firm not having enough competition to force it to provide a better ticket-buying experience for its customers.)

Fans who were unable to attain verified fan status had to either pay very high prices to see Swift's concerts or not attend. But Swift's approach to ticket selling allowed her most loyal fans to buy tickets at reasonable prices, while keeping ticket scalpers from earning more from her tour than she did.

Your Turn: Test your understanding by doing related problem 3.10 at the end of this chapter.

Solved Problem 10.3

Why Doesn't Tesla Charge Its Employees to Park Their Cars?

Tesla manufactures electric cars in a factory in California. There are a total of 4,500 parking spaces at the factory, and Tesla has about 16,000 employees working there (although they don't all work on the same shift). According to an article in the *Wall Street Journal*, the shortage of parking spaces is prompting many employees to park in unauthorized places, including up on grass medians. Some employees arrive hours before their shifts begin to secure spaces. Some employees pay other employees for spaces.

a. Use a graph to illustrate the current demand and supply for parking spaces at Tesla's factory. Indicate on your graph the market price, the quantity of parking spaces supplied, the quantity of parking spaces demanded, and any shortage or surplus of spaces.

b. Now suppose that Tesla decides to auction off the right to park in the lot. On your graph from part (a), show what the equilibrium price and equilibrium quantity will now be.

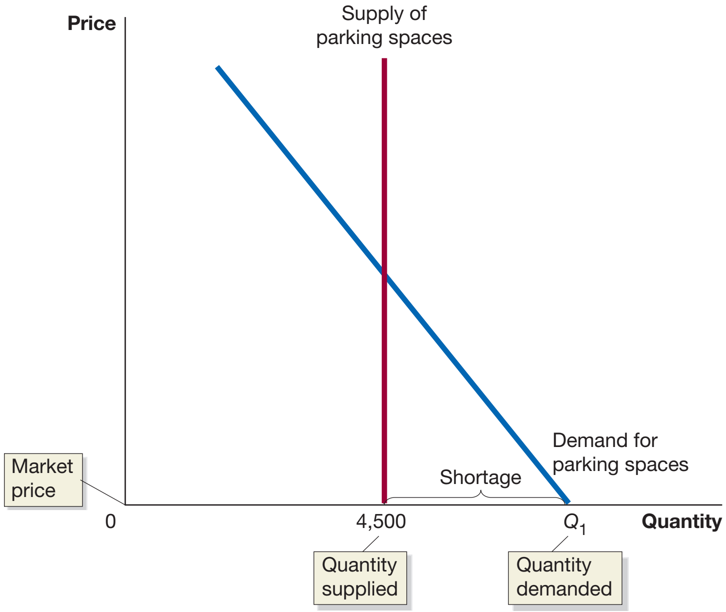
c. Would the auction approach to allocating parking spaces in part (b) be more economically efficient than the approach that Tesla actually uses? Briefly explain.

d. Is Tesla likely to adopt the auction approach to solving its parking problems given in part (b)? Briefly explain.

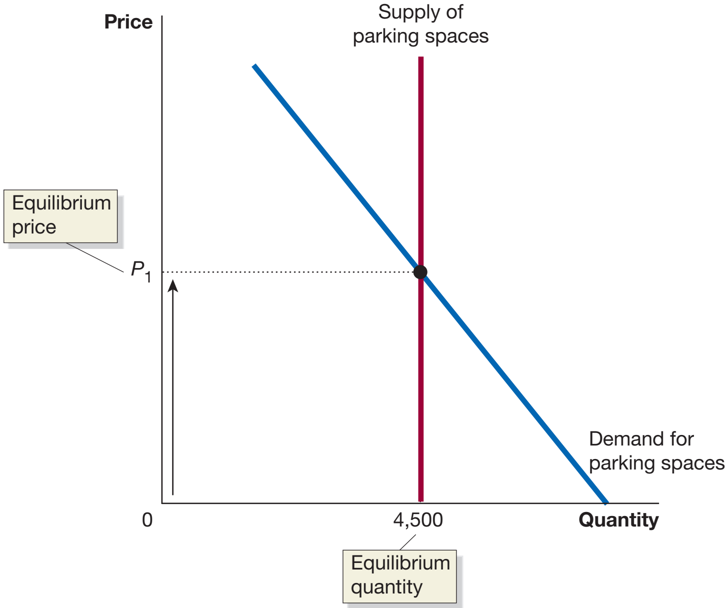
Solving the Problem

Step 1: Review the chapter material. This problem involves the reasons firms don't always raise prices, so you may want to review the section "Business Implications of Fairness." (To answer part (c), it would be helpful to review the discussion of economic efficiency in Chapter 4, Section 4.2.)

Step 2: Answer part (a) by drawing a graph of the demand and supply for parking spaces, indicating the requested information. Note that because the quantity of parking spaces is fixed at 4,500, the supply curve is a vertical line. Because Tesla doesn't charge its employees to park in the lot, the market price is 0. We don't know the actual quantity of parking spaces demanded at a price of 0, so let's label it Q_1. At a price of 0, there is a shortage of parking spaces equal to $Q_1 - 4{,}500$.



Step 3: Answer part (b) by showing on your graph the effect of Tesla's auctioning off the right to park in the lot. If Tesla auctions off the right to park in the lot, bidding among employees should cause the price to rise so that the quantity demanded falls to match the fixed quantity supplied of 4,500 spaces. We don't know exactly what this price will be, so just label it P_1 in your graph. The price has risen from 0 to P_1, the equilibrium quantity is 4,500, and the shortage has been eliminated.



Step 4: Answer part (c) by explaining that the auction approach to allocating parking spaces in part (b) is economically efficient. We saw in Chapter 4 that the demand curve measures the marginal benefit consumers receive from consuming a product. At equilibrium in a market, we expect to see the efficient outcome where the price equals the marginal benefit consumers receive from consuming the last unit of the good or service. As the figure in step 2 shows, with a price of zero, the marginal benefit from the 4,500th parking space is far above the price, so the outcome is not efficient. When Tesla auctions off the right to park in the lot, the price will rise to P_1, the quantity demanded will equal the quantity supplied, and the outcome will be economically efficient. At any other price, there will be either a surplus of parking spaces or a shortage, which was the case when the price was 0. Looked at another way, for the price to perform the function of allocating a scarce resource—parking spaces—to its highest-valued use as measured by marginal benefit, Tesla would need to allow the price to rise to P_1. Some of its employees will value a parking space at the factory more highly than others for various reasons, including whether they have access to public transportation and whether they have other commitments that make it impossible to arrive at the lot early enough to be sure of finding a space. Unless the price is allowed to adjust, people who place a lower value on the spaces may still end up parking in them.

Step 5: Answer part (d) by explaining whether Tesla is likely to adopt the auction approach to allocating parking spaces given in part (b). The situation Tesla faces is similar to the one popular Broadway shows or popular restaurants face in deciding whether to charge a market-clearing price. Doing so would seem to increase profit in the short run but might reduce profit in the long run by irritating customers who value fairness. Similarly, Tesla could solve its parking problem while making a little money and improving the economic efficiency of allocating its parking spaces if it auctioned off the right to park in its lot. But because few firms charge their employees for parking, Tesla's employees might be upset if they had to pay for it. Tesla's managers might worry that employees who are upset may not work as hard or may even quit. It's worth noting that the article in the *Wall Street Journal* discussing Tesla's parking problems doesn't indicate that the firm is even considering charging its employees to use its parking lot.

Your Turn: For more practice, do related problem 3.11 at the end of this chapter.

10.4 Behavioral Economics: Do People Make Rational Choices?

LEARNING OBJECTIVE: Describe the behavioral economics approach to understanding decision making.

When economists say that consumers and firms are behaving "rationally," they mean that consumers and firms are taking actions that are appropriate to reach their goals, given the information available to them. Some economists study situations in which people make choices that do not appear to be economically rational. This area of economics is called **behavioral economics**. Why might consumers or businesses not act rationally? The most obvious reason is that they do not realize that their actions are inconsistent with their goals. One of the objectives of economics is to suggest ways to make better decisions. In this section, we discuss ways in which people can improve their decision making by avoiding some common pitfalls. We also use ideas from behavioral economics to analyze how consumers make decisions when shopping.

Behavioral economics The study of situations in which people make choices that do not appear to be economically rational.

Pitfalls in Decision Making

People commonly commit the following three mistakes when making decisions:

1. They take into account monetary costs but ignore nonmonetary opportunity costs that don't involve explicitly spending money.
2. They fail to ignore sunk costs.
3. They are unrealistic about their future behavior.

Ignoring Nonmonetary Opportunity Costs Remember that the **opportunity cost** of any activity is the highest-valued alternative that must be given up to engage in that activity. For example, if you own something you could sell, you incur an opportunity cost if you use it yourself. It is often difficult for people to think of opportunity costs in these terms.

Opportunity cost The highest-valued alternative that must be given up to engage in an activity.

Consider the following example: One year, the National Football League ran a lottery that allowed the winners to purchase Super Bowl tickets at their face value, which was either $325 or $400, depending on where in the stadium the seats were located. The late Alan Krueger of Princeton surveyed the lottery winners, asking them two questions:

Question 1: If you had not won the lottery, would you have been willing to pay $3,000 for your ticket?
Answer 1: Ninety-four percent answered that they would not have paid $3,000 for a ticket.
Question 2: If after winning your ticket (and before arriving in Florida for the Super Bowl) someone had offered you $3,000 for your ticket, would you have sold it?
Answer 2: Ninety-two percent answered that they would not have sold their ticket for $3,000.

But these answers are contradictory! If someone offers you $3,000 for your ticket, then by using the ticket rather than selling it, you incur an opportunity cost of $3,000. There really is a $3,000 cost involved in using that ticket, even though you do not pay $3,000 in cash. The two alternatives—either paying $3,000 or not receiving $3,000—amount to exactly the same thing.

If the ticket is really *not* worth $3,000 to you, you should sell it. If it is worth $3,000 to you, you should be willing to pay $3,000 in cash to buy it. Not being willing to sell a ticket you already own for $3,000 while at the same time not being willing to buy a ticket for $3,000 if you didn't already own one is inconsistent behavior. The inconsistency comes from a failure to take into account nonmonetary opportunity costs. Behavioral economists believe this inconsistency is caused by the **endowment effect**, which is the tendency of people to be unwilling to sell a good they already own even if they are offered a price that is greater than the price they would be willing to pay to buy the good if they didn't already own it.

Endowment effect The tendency of people to be unwilling to sell a good they already own even if they are offered a price that is greater than the price they would be willing to pay to buy the good if they didn't already own it.

The failure to take into account opportunity costs is a very common error in decision making. Suppose, for example, that a friend is in a hurry to have his room cleaned—it's the Friday before parents' weekend—and he offers you $80 to do it for him. You turn him down and spend the time cleaning your own room, even though you know somebody down the hall who would be willing to clean your room for $40. Leave aside complicating details—the guy who asked you to clean his room is a real slob, or you don't want the person who offered to clean your room for $40 to go through your stuff—and you should see the point we are making. The opportunity cost of cleaning your own room is $80—the amount your friend offered to pay you to clean his room. It is inconsistent to turn down an offer from someone else to clean your room for $40 when you are doing it for yourself at a cost of $80. The key point here is this: *Nonmonetary opportunity costs are just as real as monetary costs, and people should take them into account when making decisions.*

There are many examples of businesses taking advantage of the tendency of consumers to ignore nonmonetary costs. For example, some firms sell products with mail-in rebates. Rather than have a mail-in rebate of $10, why not just cut the price by $10? Companies are relying on the fact that failing to mail in a rebate form once you have already paid for a product is a nonmonetary opportunity cost rather than a direct monetary cost. In fact, only a small percentage of customers actually mail in rebates.

Failing to Ignore Sunk Costs A **sunk cost** is a cost that has already been paid and cannot be recovered. Once you have paid money and can't get it back, you should ignore that money in any later decisions you make. Consider the following two situations:

Sunk cost A cost that has already been paid and cannot be recovered.

Situation 1: You bought a ticket to a play for $75. The ticket is nonrefundable and must be used on Tuesday night. An hour before the play will begin (too late to successfully resell your ticket on StubHub or another site), a friend calls and invites you to a local comedy club to see a comedian you both like who is appearing only on Tuesday night. Your friend offers to pay the cost of going to the club.
Situation 2: It's Tuesday afternoon, and you are about to buy a ticket for that night's performance of the same play as in situation 1. As you are logging on to the theater's site to buy the ticket, your friend calls and invites you to the comedy club.

Would your decision to go to the play or the comedy club be different in situation 1 than in situation 2? Most people would say that in situation 1, they would go to the play because otherwise they would lose the $75 they had paid for the ticket. In fact, the $75 is "lost" no matter what you do because the ticket is nonrefundable, and you don't have time to resell it. The only real issue for you to decide is whether you would prefer to see the play or prefer to go with your friend to the comedy club. If you would prefer to go to the club, the fact that you have already paid $75 for the ticket to the play is irrelevant. Your decision should be the same in situation 1 as in situation 2.

Being Unrealistic about Future Behavior Obesity is an increasing problem in the United States. Why do some people end up eating too much? One possibility is that they receive more utility from eating high-calorie foods than they would from being thin. There are many people, though, who overeat today because they expect to eat less tomorrow. But they never do eat less, and so they end up overweight. (Of course, some people also suffer from medical problems that lead to weight gain.) Similarly, some people continue smoking today because they expect to be able to give it up sometime in the future. Unfortunately, for many people that time never comes, and they suffer the health consequences of years of smoking. In both these cases, people are overvaluing the utility from current choices—eating chocolate cake or smoking—and undervaluing the utility to be received in the future from being thin or avoiding lung cancer.

Economists who have studied this question argue that many people have preferences that are not consistent over time. In the long run, you would like to be thin or give up smoking or achieve some other goal, but each day you make decisions (such as to eat too much or smoke) that are not consistent with this long-run goal. If you are unrealistic about your future behavior, you underestimate the costs of choices—such as overeating or smoking—that you make today. A key way of avoiding this problem is to be realistic about your future behavior, although that can be difficult to do!

Taking into account nonmonetary opportunity costs, ignoring sunk costs, and being more realistic about future behavior are three ways in which consumers are able to improve the decisions they make.

"Nudges": Using Behavioral Economics to Guide Behavior

Richard Thaler, winner of the 2017 Nobel Prize in Economics, has popularized the idea of devising *nudges* to lead people to making better decisions. Let's consider two examples.

Saving for Retirement Many people are unrealistic about their future behavior, and they save too little for retirement. As a result, some firms find that fewer than the expected number of employees enroll in voluntary retirement savings plans known as 401(k) plans. Although these employees have a long-run goal of saving enough to enjoy a comfortable retirement, in the short run, they spend more than is consistent with attaining their goal. At the suggestion of behavioral economists, many firms now automatically enroll employees in these retirement plans, giving them the option to leave the plan if they choose to. To a fully rational employee, the decision about whether to save through a 401(k) plan should be independent of the minor amount of paperwork involved in either enrolling in a plan or leaving a plan in which the employer has enrolled the employee. In practice, though, automatically enrolling employees in a plan means that to leave the plan, the employees must confront the inconsistency between their short-run actions of spending too much and their long-run goal of a comfortable retirement. Rather than confront their inconsistency, most employees choose to remain in the plan.

Improving Health Care Many people with serious illnesses fail to regularly take their prescription medication. Even though they have the long-run goal of becoming well, the short-run inconvenience of taking the medication causes them to skip some doses. Using insights from behavioral economics, the designers of the Wellth app deposit $150 into a patient's account. Each morning the app sends the patient a reminder to take his medicine. If he snaps a selfie of himself taking the medicine each day for 90 days, he gets to keep the $150. He has money subtracted for each day he fails to take his medicine. The app designers claim that the app can reduce by more than 40 percent hospital readmissions due to patients failing to take their prescriptions.

Doctors who prescribe antibiotics for medical problems, such as a cold or the flu, for which antibiotics are ineffective, contribute to the spread of antibiotic-resistant bacteria. Some doctors are overconfident about knowing when it is appropriate to prescribe antibiotics. Accordingly, studies show that providing doctors with information on non-antibiotic treatments is not an effective way of reducing overuse of antibiotics. It is much more effective to send doctors e-mails showing how their rates of prescribing antibiotics compare with the rates of "top performing" doctors. Similarly, many doctors are overconfident in their ability to avoid illnesses they may contract as a result of failing to wash their hands while seeing patients. Signs posted in hospitals reminding doctors that they are risking their own health by not washing their hands have been less effective in increasing hand washing than have signs reminding doctors that they are risking their patients' health by not washing their hands.

The Behavioral Economics of Shopping

In Section 10.1, we analyzed how consumers can choose the products they buy in order to maximize utility. In this section, we briefly consider problems consumers may encounter that keep them from making optimal consumption choices when shopping.

In discussing how consumers maximize utility, we used simple examples in which people were choosing the optimal quantity of two goods, subject to a budget constraint. Consider, though, a typical trip to the supermarket. Someone shopping for a family of four might end up buying 25 or more products. A consumer in that situation is unlikely to equate the ratios of the marginal utilities to the prices for all those products when deciding the quantities to buy. Does it matter that consumers often make consumption choices that are not optimal in this sense? Economists are divided in their answers to this question. Many economists make these two points in arguing that it doesn't matter:

1. The assumptions in most scientific models, including economic models, are not literally correct. In the model of consumer choice, for example, unrealistic assumptions are necessary to simplify a complex reality by focusing on the most important factors involved in decision making.

2. Models are best judged by the success of their predictions rather than by the realism of their assumptions. Predictions based on the model of consumer choice have been successful in predicting many types of consumer behavior.

Rules of Thumb Behavioral economists argue that it *does* matter that consumers usually do not make optimal consumption choices. These economists believe that there are benefits to analyzing *how* consumers actually make decisions. The model we have used in this chapter assumes that:

- When people shop, they have full information on the prices of products, including information on differences in prices across stores.
- People can make complicated calculations such as computing the ratios of marginal utilities to prices across many products.

In fact, people often make choices on the basis of only limited information and without the time or capacity to calculate their optimal choices. As a result, rather than make optimal choices, people often use *rules of thumb*, which are guides to decision making that may not produce optimal choices. For example, you may decide that a particular supermarket has the lowest prices for the products you buy, without continually checking whether this assumption is correct. If a new supermarket with lower prices opens, you may continue shopping at the old supermarket, at least for a period, even though doing so is no longer optimal.

Anchoring How do shoppers decide whether the price of a product is high or low? Behavioral economists use the term *anchoring* to describe one aspect of how consumers evaluate prices. If people are uncertain about a value, such as a price, they often relate—or anchor—that value to some other known value, even if the second value is irrelevant. Psychologists Amos Tversky and Daniel Kahneman carried out an experiment to illustrate the effects of anchoring. They constructed a wheel that, when spun, always stopped on a value of either 10 or 65. For each group of participants in the experiment, they spun the wheel and then asked that group: "What is your best guess of the percentage of African nations in the United Nations?" When the wheel stopped on a value of 10 when spun for that group, the average answer was 25 percent. When the wheel stopped on 65, the average answer was 45 percent. Even though the value from the spin of the wheel had no relevance to the question being asked, the value anchored the participants' responses. In another experiment, conducted by Brian Wansink of Cornell University, Robert Kent of the University of Delaware, and Stephen Hoch of the University of Pennsylvania, three supermarkets offered cans of Campbell's soup for sale at a 12 percent reduction in price. On one day during the sale, a display sign stated "Limit of 12 per person"; on another day, a display sign said "No limit per person." On the day when the sign limited sales, the supermarkets sold an average of 7 cans per person. On the day when the sign stated there was no limit on sales, the supermarkets sold 3.3 cans per person. The number 12 on the sign had anchored the shoppers' decisions about how many cans to buy.

Consumers often lack the information to evaluate whether the price of a good is "high" or "low." Stores can take advantage of this lack of information to anchor consumers' estimates by marking a high "regular price" on a product, which makes the discounted "sale price" appear to be a bargain even if the product is very rarely offered for sale at the regular price.

Apply the Concept

Trying to Use the Apple Approach to Save J.C. Penney

For many years, department stores struggled due to the rise of online sellers like Amazon and changing consumer tastes favoring "fashion-forward" or "fast-fashion" clothing. The 2020 Covid–19 pandemic caused a further drop in sales. During those years, many chains closed stores, and some went bankrupt. In 2011, J.C. Penney tried to take a new path by hiring Ron Johnson as its CEO. Johnson had had a very successful career as the head of Apple's retail stores. During the previous year, J.C. Penney had advertised 600 "sales," and it had sold almost three-quarters of its products at prices marked down by at least 50 percent. However, these sales were illusions because Penney had raised prices before discounting them. The company had also often required customers to clip coupons to get the sale price.

Johnson tried a new pricing strategy of offering goods at "everyday low prices" and rarely discounting prices below those levels. But the new strategy failed, and J.C. Penney's revenue declined. Johnson was fired as CEO after only 17 months.

Ideas from behavioral economics can help explain what went wrong. Johnson assumed that consumers would understand that the everyday low prices really were low, at least compared with the very high regular prices that J.C. Penney had previously used when calculating the discounts it advertised during a sale. However, there is substantial evidence that some consumers are not well aware of prices even for goods they buy regularly. One study of supermarket shoppers asked people the prices of goods they had just placed in their shopping carts. Fewer than half the shoppers could accurately recall the prices, and one-quarter couldn't even offer a guess, even though they had placed the goods in their carts less than a minute earlier. Another study asked people who were about to enter a department store questions about the prices of goods they frequently purchased. Only about one-third could give accurate answers. When asked to evaluate whether a specific price of a good they frequently purchased was high or low, about 15 percent of people identified prices that were actually high as being good deals and prices that were actually low as being bad deals.

$18 june
american living
polo
$25 everyday

Bebeto Matthews/AP Images

Consumers generally respond strongly to sales that offer discounted prices, so a strategy that replaces sales with low fixed prices is not likely to be effective.

Studies of retail sales show that consumers purchase a significant fraction of goods at discount prices. For example, a study of checkout scanner data from nine supermarkets showed that while liquid laundry detergent was offered at discount prices only about one-quarter of the time, nearly half of detergent was purchased at the sale prices. Because consumers respond so strongly to sales that offer discounted prices, a strategy that replaces sales with low fixed prices is not likely to be effective.

Why do consumers respond to sales? Why wasn't J.C. Penney able to convince consumers that everyday low prices really were low? One possibility is that by displaying both a high "regular price" and a low "sale price," a sale provides consumers with an anchor, or a reference point, to interpret the prices being offered. A sale price seems low if offered as a markdown from a higher regular price even if—because of sales and the use of coupons—few people ever buy the good at the regular price. Without the anchor of the regular price, consumers can have difficulty deciding whether an everyday low price is actually low, particularly because some consumers enter a store with little idea of what typical prices are. As Alexander Chernev of Northwestern University put it, "J.C. Penney might say it's a fair price, but why should consumers trust J.C. Penney?" As we saw in the chapter opener, Mark Tritton may have made a similar error when he took over as CEO of Bed Bath & Beyond in 2019. By greatly reducing the number of Big Blue 20 percent off coupons the firm mailed out, Tritton may have made it difficult for customers to decide whether Bed Bath & Beyond's prices were actually low.

By largely eliminating sales, Johnson and Tritton disregarded some of the insights of behavioral economics. As a result, J.C. Penney and Bed Bath & Beyond suffered losses, and both Johnson and Tritton lost their jobs.

Your Turn: Test your understanding by doing related problems 4.16 and 4.17 at the end of this chapter.

Continued from chapter opener

Economics in Your Life & Career

How Should You Price Tickets to Concert or to a Hit Broadway Show?

At the beginning of this chapter, we asked you to give advice on ticket pricing for a theater or concert venue and to explain why most theater producers and concert promoters do not charge the highest price that will allow them to sell all the available tickets.

We have seen in this chapter that many consumers act as if they believe fairness is important. In particular, consumers often object to price increases they believe result from a firm experiencing an increase in demand rather than an increase in cost. As a result, many theater producers and concert promoters are reluctant to charge very high prices for performances of a popular show or band because they believe that doing so will alienate their customers and make it harder to sell tickets to future shows. These producers and promoters believe that allowing ticket scalpers to take some of their profit in the short run is acceptable because charging lower prices helps increase their profit in the long run.

Conclusion

In a market system, consumers are in the driver's seat. Goods are produced only if consumers want them to be. Therefore, how consumers make their decisions is an important area for economists to study. Economists expect that consumers will spend their incomes so that the last dollar spent on each good provides them with equal additional amounts of satisfaction, or utility. In practice, there are significant social influences on consumer decision making, particularly when a good or service is consumed in public. Most consumers also seem to value fairness. Finally, many consumers could improve the decisions they make by taking into account nonmonetary opportunity costs, ignoring sunk costs, and being more realistic about their future behavior.

In this chapter, we studied consumers' choices. In the next several chapters, we will study firms' choices.

CHAPTER SUMMARY AND PROBLEMS

Key Terms

Behavioral economics, p. 358
Budget constraint, p. 340
Endowment effect, p. 358
Income effect, p. 345
Law of diminishing marginal utility, p. 340
Marginal utility (*MU*), p. 340
Network externality, p. 350
Opportunity cost, p. 358
Substitution effect, p. 345
Sunk cost, p. 359
Utility, p. 338

10.1 Utility and Consumer Decision Making

LEARNING OBJECTIVE: Define utility and explain how consumers choose goods and services to maximize their utility.

Summary

Utility is the enjoyment or satisfaction that people receive from consuming goods and services. The goal of a consumer is to spend available income so as to maximize utility. **Marginal utility (*MU*)** is the change in total utility a person receives from consuming one additional unit of a good or service. The **law of diminishing marginal utility** states that consumers receive diminishing additional satisfaction as they consume more of a good or service during a given period of time. The **budget constraint** is the amount of income consumers have available to spend on goods and services. To maximize utility, consumers should make sure they spend their income so that the last dollar spent on each product gives them the same marginal utility. The **income effect** is the change in the quantity demanded of a good that results from the effect of a change in the price on consumer purchasing power. The **substitution effect** is the change in the quantity demanded of a good that results from a change in price making the good more or less expensive relative to other goods, holding constant the effect of the price change on consumer purchasing power.

Review Questions

1.1 What is the economic definition of *utility*? Is it possible to measure utility?

1.2 What is the definition of *marginal utility*? What is the law of diminishing marginal utility? Why is marginal utility more useful than total utility in consumer decision making?

1.3 What is meant by a consumer's *budget constraint*? What is the rule of equal marginal utility per dollar spent?

1.4 How does a change in the price of a product cause both a substitution effect and an income effect?

Problems and Applications

1.5 Does the law of diminishing marginal utility hold true in every situation? Is it possible to think of goods for which consuming additional units, at least initially, will result in increasing marginal utility?

1.6 An article on economist.com notes that the British economist Alfred Marshall once observed that "the more we listen to good music, the more we want to buy." If Marshall was correct, do people consuming good music experience diminishing marginal utility? Briefly explain.

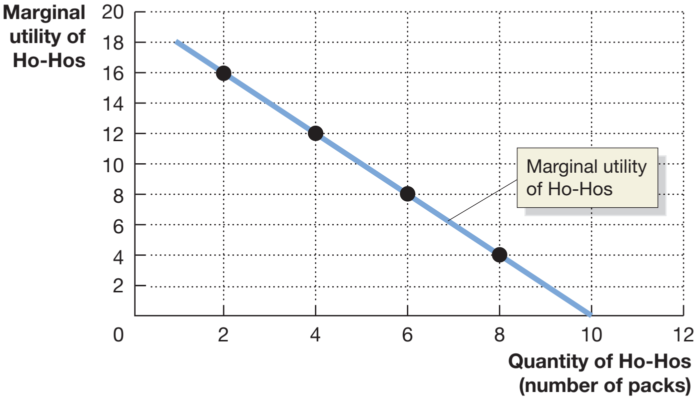
1.7 You have 6 hours to study for two exams tomorrow. The following table shows the relationship between hours of study and test scores.

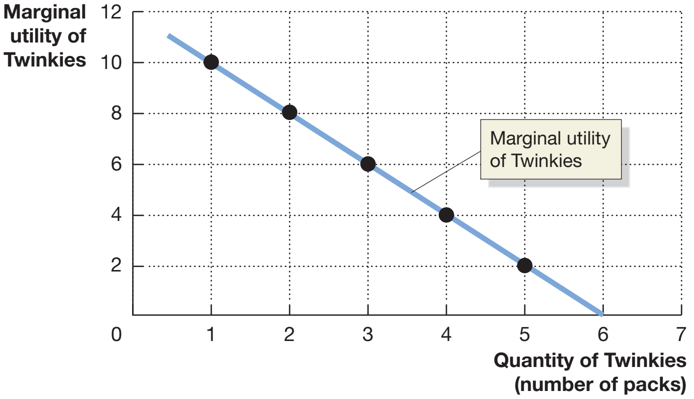
Economics		Psychology	
Hours	Score	Hours	Score
0	54	0	54
1	62	1	60
2	69	2	65
3	75	3	69
4	80	4	72
5	84	5	74
6	87	6	75

a. Use the rule for determining optimal purchases to decide how many hours you should study each subject. Treat each point on an exam as 1 unit of utility and assume that you consider an extra point on an economics exam to have the same value as an extra point on a psychology exam.

b. Now suppose that you are a psychology major and that you value each point you earn on a psychology exam as being worth three times as much as each point you earn on an economics exam. Now how many hours should you study each subject?

1.8 [Related to Solved Problem 10.1] Joe has $16 to spend on Twinkies and Ho-Hos. Twinkies have a price of $1 per pack, and Ho-Hos have a price of $2 per pack. Use the information in the following graphs to determine the number of Twinkies and Ho-Hos packs Joe should buy to maximize his utility. Briefly explain your reasoning.





1.9 **[Related to Solved Problem 10.1]** José has $55 to spend on apples and oranges. Given the information in the following table, is José maximizing utility? Briefly explain.

	Price	Quantity	Total Utility	Marginal Utility of Last Unit
Apples	$0.50	50	1,000	20
Oranges	$0.75	40	500	30

1.10 Maya spends her $50 budget on two goods: cans of tuna and bottles of ginger ale. Initially, the marginal utility per dollar she spends on tuna is equal to the marginal utility per dollar she spends on ginger ale. Then the price of ginger ale decreases, while her income and the price of tuna do not change. Determine whether each of the following statements about what happens as a result of the decrease in the price of ginger ale is true or false and briefly explain why.

- **a.** Maya's marginal utility from consuming ginger ale increases.
- **b.** The marginal utility per dollar Maya spends on ginger ale increases.
- **c.** Because of the substitution effect, Maya will buy more ginger ale. Therefore, we can conclude that ginger ale is a normal good.
- **d.** As Maya adjusts to the change in the price of ginger ale, her marginal utility per dollar spent on tuna will increase.

1.11 **[Related to the Don't Let This Happen to You "Equalize Marginal Utilities *per Dollar*"]** LaToya is buying corn chips and soda. She has 4 bags of corn chips and 5 bottles of soda in her shopping cart. The marginal utility of the fourth bag of corn chips is 10, and the marginal utility of the fifth bottle of soda is also 10. Is LaToya maximizing utility? Briefly explain.

1.12 **[Related to the Don't Let This Happen to You "The Income Effect Doesn't Involve an Increase in Money Income"]** A student concludes: "When I got a raise from $12 per hour to $14 at my part-time job, I started streaming more movies on iTunes. My response to the raise is an example of the income effect used in analyzing how consumers make their choices." Briefly explain whether you agree.

10.2 Where Demand Curves Come From

LEARNING OBJECTIVE: Use the concept of utility to explain the law of demand.

Summary

When the price of a good falls, the ratio of the marginal utility to price rises. This change leads consumers to buy more of that good. As a result, whenever the price of a product falls, the quantity demanded increases. We saw in Chapter 3, Section 3.1 that this relationship is known as the *law of demand*. The market demand curve can be constructed from the individual demand curves for all the consumers in the market.

Review Questions

2.1 Explain how a downward-sloping demand curve results from consumers adjusting their consumption choices to changes in price.

2.2 How is the market demand curve derived from consumers' individual demand curves?

2.3 What would need to be true for a demand curve to be upward sloping?

Problems and Applications

2.4 Considering only the income effect, if the price of an inferior good declines, would a consumer want to buy a larger quantity or a smaller quantity of the good? Does your answer mean that the demand curves for inferior goods should slope upward? Briefly explain.

2.5 The chapter states that "when the price of an inferior good falls, the income effect and substitution effect work in opposite directions." Explain what this statement means.

2.6 Suppose the market for ice cream cones is made up of three consumers: Tiago, Terrell, and Tim. Use the information in the following table to construct the market demand curve for ice cream cones. Show the information in a table and in a graph.

	Tiago	Terrell	Tim
Price	Quantity Demanded (cones per week)	Quantity Demanded (cones per week)	Quantity Demanded (cones per week)
$1.75	2	1	0
1.50	4	3	2
1.25	6	4	3
1.00	7	6	4
0.75	9	7	5

2.7 Marty and Ann discussed the rule of equal marginal utility per dollar spent, a topic that was recently covered in the economics course they were both taking:

Marty: "When I use my calculator to divide the marginal utility of pizza by a price of zero, I don't get an answer. This result must mean that if pizza were being sold for a price of zero, the quantity demanded would be infinite."

Ann: "Marty, that can't be true. No producer would be willing to 'sell' pizza, or any other product, for a zero price. Quantity demanded cannot be infinite, so zero prices cannot appear on demand curves and demand schedules."

Suppose that Marty and Ann ask you for advice in resolving their disagreement. What would you tell them?

2.8 Consider two goods: pizza and Coke. Along an individual's demand curve for pizza, as the price of pizza falls, does the marginal utility per dollar spent on pizza always equal the marginal utility per dollar spent on Coke? In other words, does the rule of equal marginal utility per dollar spent hold as the price changes and you move up or down the demand curve? How can the rule hold, given that the price of pizza changes along the demand curve? If you need help to answer this problem, look back at the discussion of Figure 10.2.

2.9 **[Related to the Apply the Concept "Are There Any Upward-Sloping Demand Curves in the Real World?"]** A columnist on forbes.com discussed a proposal in the United Kingdom to have a minimum price for alcohol. He wondered whether heavy drinkers would "reduce their consumption or whether they'll just substitute away from other things. . . . Really, is alcohol a Giffen Good for a heavy drinker?" Explain his reasoning that alcohol may be a Giffen good for heavy drinkers.

2.10 **[Related to the Apply the Concept "Are There Any Upward-Sloping Demand Curves in the Real World?"]** In studying the consumption of very poor families in China, Robert Jensen and Nolan Miller found that in both Hunan and Gansu, "Giffen behavior is most likely to be found among a range of households that are poor (but not too poor or too rich)."

a. What do Jensen and Miller mean by "Giffen behavior"?
b. Why would the poorest of the poor be less likely than people with slightly higher incomes to exhibit this behavior?
c. Why must a good make up a very large portion of consumers' budgets to be a Giffen good?

2.11 At the end of an online article, the editors of the *Wall Street Journal* added the following note:

> Luxury goods that see increased demand with higher prices are called Veblen goods, named for American economist Thorstein Veblen, who described the phenomenon. An earlier version of this article incorrectly referred to such items as Giffen goods as identified by Scottish economist Robert Giffen.

Is it true that if the demand for a good increases as the price increases, holding all other factors constant, the good cannot be a Giffen good? Briefly explain.

2.12 According to the U.S. Energy Information Administration, the average price of a gallon of gasoline decreased from $4.93 in June 2022 to $3.21 in December. For the following questions, assume that no factor that affects the demand for gasoline, other than its price, changed during the months from June to December 2022.

a. If households in the United States increased their consumption of gasoline during these months, can we conclude that for these households gasoline is a normal good? Briefly explain.
b. If households decreased their consumption of gasoline during these months, can we conclude that for these households gasoline is an inferior good? Briefly explain.
c. If households decreased their consumption of gasoline during these months, can we conclude that for these households gasoline is a Giffen good? Briefly explain.

10.3 Social Influences on Decision Making

LEARNING OBJECTIVE: Explain how social influences can affect consumption choices.

Summary

Social factors can have an effect on consumption. For example, the amount of utility people receive from consuming a good often depends on how many other people they know also consume the good. There is a **network externality** in the consumption of a product if the usefulness of the product increases with the number of consumers who use it. There is evidence that people like to be treated fairly and that they usually attempt to treat others fairly, even if doing so makes them worse off financially. This result has been demonstrated in laboratory experiments such as the ultimatum game. When firms set prices, they take into account consumers' preference for fairness. For example, hardware stores often do not increase the price of snow shovels to take advantage of a temporary increase in demand following a snowstorm.

Review Questions

3.1 In which of the following situations are social influences on consumer decision making likely to be greater: choosing a restaurant for dinner or choosing which brand of toothpaste to buy? Briefly explain.

3.2 What are network externalities? For what types of products are network externalities likely to be important? What is path dependence?

3.3 How does the fact that consumers apparently value fairness affect the pricing decisions that businesses make?

Problems and Applications

3.4 Which of the following products are most likely to have significant network externalities? Briefly explain.
- **a.** Smartphones
- **b.** Dog food
- **c.** Board games
- **d.** TikTok
- **e.** Toothpaste

3.5 An opinion column in the *Wall Street Journal* discussed Amazon Prime. If you buy Amazon Prime for a fee of $14.99 per month or $139 per year, you receive benefits including free shipping on products ordered from Amazon and the ability to stream certain movies and television series free. According to the author, "Amazon Prime, with its more than 100 million members, is a classic beneficiary of a network externality." Briefly explain whether you agree.

3.6 **[Related to the Apply the Concept "Mark Zuckerberg . . . Alone in the Metaverse?"]** In 2023, an article in the *Wall Street Journal* described Meta's problems with the virtual reality app Horizons:

> Among Horizon's biggest problems is its inability to keep users. Players download the game on their Quest virtual-reality headsets, try it out and fail to find any experiences or fellow gamers that motivate them to return. . . . Horizon's weekly retention rate sat at 11% in January, meaning that only about one in nine users play again the following month.

What economic concept helps to explain the problem Meta was facing with this app? How might the firm overcome this problem?

3.7 **[Related to the Chapter Opener]** An article in the *Wall Street Journal* discussed the problems that Bed Bath & Beyond encountered during 2022. According to the article, before CEO Mark Tritton joined the firm, "Bed Bath & Beyond followed a 'pile it high, let it fly' philosophy with goods sometimes stacked to the ceiling, giving its stores a cluttered, treasure-hunt feel that shoppers loved." Customers apparently enjoyed telling their friends about the products they would find among the clutter, such as "July 4th-themed corn holders."
- **a.** How did Tritton change this aspect of Bed Bath & Beyond's strategy?
- **b.** What concepts in this chapter might help to explain why Tritton's new strategy failed?

3.8 In August 2022, an article in the *Wall Street Journal* discussed the Disney Company increasing the prices for admission to its Disneyland and Walt Disney World theme parks. As a result of the price increases, "for the quarter that ended July 2 [2022], the business unit that includes the theme parks . . . posted record revenue of $5.42 billion and record operating income of $1.65 billion." The increase in revenue occurred even though "attendance at Disney's U.S. parks fell by 17% compared with the previous year."

The article also contains the following observations about Disney's ticket price increases:
1. "Disney's theme-park pricing is determined by 'pure supply and demand,' said a company spokeswoman."
2. "The changes driving the increases in revenue and profit have drawn the ire of what Disney calls 'legacy fans,' or longtime parks loyalists."
   - **a.** Briefly explain what must be true of the demand for tickets to Disney's theme parks if its revenue from ticket sales increased even though it sold 17 percent fewer tickets. (For the sake of simplicity, ignore any other sources of revenue Disney earns from its theme parks apart from ticket sales.)
   - **b.** Briefly discuss whether how consumers regard fairness is relevant to Disney's managers as they determine the prices for tickets to the theme parks.

3.9 **[Related to the Economics in Your Life & Career]** An article in the *Economist* noted that for the hit Broadway musical *Hamilton*, "every time the show's producers release a new block [of tickets] to sell, they immediately get snapped up by 'ticket bots,' high-speed ticket-buying software." The musical's producer called the ticket bots "computerized cheaters."
- **a.** How do people earn a profit from using the bots to buy tickets?
- **b.** Is there a strategy the musical's producer could use to eliminate the profit earned by the ticket bots? If so, why doesn't he use it?

3.10 **[Related to the Apply the Concept "Taylor Swift Tries to Please Fans *and* Make Money"]** An article in the *Wall Street Journal* reported the following about Taylor Swift's 2023 The Eras Tour: "Ms. Swift's 52-date stadium run sold over two million tickets on Tuesday—more than any other artist in a single day, according to [Ticketmaster]. Tuesday's presale was limited to a select group of people who had registered with Ticketmaster, part of an effort to ensure that actual fans, rather than scalpers, got first crack at tickets."
- **a.** What are scalpers? What has to be true for scalping to be profitable?
- **b.** What was Swift's strategy for selling tickets on this tour? Would an alternative strategy have earned her more money from the tour? If so, why didn't she use that strategy?

3.11 **[Related to Solved Problem 10.3]** An article in the *Wall Street Journal* on the parking problems at Tesla's Fremont, California, factory noted that "Tesla has tried to encourage alternatives to driving, such as biking, public transportation and the shuttle buses provided from around the Bay Area."
- **a.** If Tesla auctioned off the right to park in its lot, would the firm need to provide other encouragement for employees to use alternative means of transportation? Briefly explain.
- **b.** Is the most economically efficient allocation of parking spaces in Tesla's lot likely to result from auctioning off the right to park or from keeping parking free while encouraging employees to use alternative means of getting to work? Briefly explain.
- **c.** Given your answer to part (b), why hasn't Tesla considered charging employees for parking in its lot?

10.4 Behavioral Economics: Do People Make Rational Choices?

LEARNING OBJECTIVE: Describe the behavioral economics approach to understanding decision making.

Summary

Behavioral economics is the study of situations in which people act in ways that are not economically rational. **Opportunity cost** is the highest-valued alternative that must be given up to engage in an activity. People would improve their decision making if they took into account nonmonetary opportunity costs. People sometimes ignore nonmonetary opportunity costs because of the **endowment effect**—the tendency of people to be unwilling to sell something they already own even if they are offered a price that is greater than the price they would be willing to pay to buy the good if they didn't already own it. People would also improve their decision making if they ignored *sunk costs*. A **sunk cost** is a cost that has already been paid and cannot be recovered. Finally, people would improve their decision making if they were more realistic about their future behavior. Behavioral economics gives insights into consumer behavior that can guide business strategies.

Review Questions

4.1 What does it mean to be economically rational?

4.2 Define *behavioral economics*. What are the three common mistakes that consumers often make? Give an example of each mistake.

4.3 Does using rules of thumb increase or decrease the likelihood of a consumer making an optimal choice? Briefly explain.

4.4 What is anchoring? How might a firm use anchoring to influence consumer choices in order to increase sales?

Problems and Applications

4.5 Marvin visits his aunt and uncle, who live in Milwaukee. The Milwaukee Bucks basketball team is scheduled to play a home game against the Golden State Warriors during Marvin's visit. An online broker has a ticket for sale in Section 212 of the arena where the game will be played, but the price, $75, is more than Marvin is willing to pay. From another online ticket broker, he buys a ticket for $50 for a seat in Section 212 of the arena. On the day of the game, a friend of Marvin's uncle offers to pay Marvin $75 for his ticket. He declines the offer. How can Marvin's refusal to sell his ticket be explained?

4.6 Richard Thaler, winner of the 2017 Nobel Prize in Economics, was first to use the term *endowment effect* to describe placing a higher value on something already owned than would be placed on the object if not currently owned. According to an article in the *Economist*:

> Dr. Thaler, who recently had some expensive bottles of wine stolen, observes that he is "now confronted with precisely one of my own experiments: These are bottles I wasn't planning to sell and now I'm going to get a cheque from an insurance company and most of these bottles I will not buy. I'm a good enough economist to know there's a bit of an inconsistency there."

Based on Thaler's statement, how do his stolen bottles of wine illustrate the endowment effect? Why did he make the statement "I'm a good enough economist to know there's a bit of an inconsistency there"?

4.7 Suppose that you are a big fan of J.K. Rowling's Harry Potter books. You would love to own a copy of the very first printing of the first book in the series, but unfortunately you can't find it for sale for less than $5,000. You are willing to pay at most $200 for a copy but can't find one at that price until one day, in a used bookstore, you see a copy selling for $10, and you immediately buy it. Are you being irrational if you keep the copy rather than sell it?

4.8 Louis Vuitton sells luxury handbags and other consumer goods to wealthy consumers. For instance, a Capucines bag has a price of $6,900, and the polka dot version of the bag has a price of $7,100. Louis Vuitton launched a new product line with lower prices to serve consumers who want to be seen using fashionable brands. For instance, the company began selling a polo shirt with the LV logo for a price of $530. Assume that Ayaan purchased a polka dot Capucines handbag for $7,100, and Gary bought a polo shirt with the LV logo for $530.

- **a.** Ayaan was willing to pay as much as $8,000 for the polka dot Capucines handbag. Gary was willing to pay no more than $530 for the polo shirt. How much consumer surplus did Ayann receive from her purchase? How much consumer surplus did Gary receive from his purchase?
- **b.** Was it irrational for Ayann to pay $7,100 for a handbag when she could have purchased another handbag for a much lower price?
- **c.** Is it easy or difficult for a consumer to determine how much consumer surplus he or she receives from a given purchase? Briefly explain.

4.9 Someone who owns a townhouse wrote to a real estate advice columnist to ask whether he should sell his townhouse or wait and sell it in the future, when he hoped that prices would be higher. The columnist replied: "Ask yourself: Would you buy this townhouse today as an investment? Because every day you don't sell it, you're buying it." Do you agree with the columnist? In what sense are you buying something if you don't sell it? Should the owner's decision about whether to sell depend on what price he originally paid for the townhouse?

4.10 An opinion column in the *Washington Post* observes that "no 'rational' person would go to the gym merely because they had purchased a nonrefundable membership. But real people do precisely that."

- **a.** Why did the author put the word *rational* in quotation marks?
- **b.** Briefly explain which error in decision making the people who "do precisely that" are making.

4.11 Before the 2020 Major League Baseball season, the Cincinnati Reds signed infielder Mike Moustakas to a contract that would pay him a total of $64 million over 4 years. Before the 2023 season, Reds General Manager Nick Krall decided to drop Moustakas from the team, even though the Reds would still have to pay him a salary of $22 million despite his no longer playing for them. Krall was quoted as saying: "We're already paying him. . . . [But] I just think for us, we had to make sure we're making the best decision for our organization." Because they have to pay Moustakas the same amount whether he plays for the team or not, wouldn't playing him be the "best decision" for the Reds rather than wasting $22 million on a player who won't be on the team? Briefly explain.

4.12 The following excerpt is from a letter sent to a financial advice columnist: "My wife and I are trying to decide how to invest a $250,000 windfall. She wants to pay off our $114,000 mortgage, but I'm not eager to do that because we refinanced only nine months ago, paying $3,000 in fees and costs." Briefly discuss what effect the $3,000 refinancing cost should have on this couple's investment decision.

4.13 Andrea grew up enjoying her Italian grandmother's home-cooked meals. Chicken and pasta with meatballs were her favorite foods. But after Andrea graduated from college, found a job, and got married, she became a vegetarian and no longer ate chicken or meatballs. Briefly explain which of the following statements provides the most likely explanation of Andrea's decision to become a vegetarian:

- When Andrea was young, she was unrealistic about her future behavior. Therefore, she did not act rationally.
- Andrea was not working when she was young. After she graduated from college and became employed, her income rose. We can conclude that for Andrea, chicken, meatballs, and other meat products are inferior goods.
- Social influences explain Andrea's decision to become a vegetarian. More people, including celebrities from the entertainment field, have become vegetarians. Andrea became a vegetarian because she now feels a kinship with these celebrities, and being a vegetarian makes her appear to be fashionable.

4.14 In an article in the *Quarterly Journal of Economics*, Ted O'Donoghue and Matthew Rabin made the following observation: "People have self-control problems caused by a tendency to pursue immediate gratification in a way that their 'long-run selves' do not appreciate." What do they mean by people's "long-run selves"? Give two examples of people pursuing immediate gratification that their long-run selves would not appreciate.

4.15 Shawn Van Dyke, a construction industry consultant, wrote on a home building site:

> Brains do some pretty funny things when making a buying decision. If you understand your customers' brain activities, then you can use this knowledge to help increase your sales and deliver on value . . . . There's an old question in advertising. "How do you sell a $2,000 watch? Put it next to a $10,000 watch." This is an example of price anchoring.

a. What is price anchoring?
b. Explain why Van Dyke cited the "old question in advertising" as an example of price anchoring.

4.16 **[Related to the Apply the Concept "Trying to Use the Apple Approach to Save J.C. Penney"]** In an interview with *Barron's*, Ron Johnson reflected on his time as CEO at J.C. Penney: "Young people didn't shop at J.C. Penney. So how do you appeal to the next generation customer? You've got to reinvent how they experienced the store. . . . A young person wants the best price every day. So we went to everyday pricing." What problems did Johnson encounter in trying to implement this policy?

4.17 **[Related to the Apply the Concept "Trying to Use the Apple Approach to Save J.C. Penney"]** An article in the *New York Times* about J.C. Penney's pricing strategy under former CEO Ron Johnson observed, "Penney had pulled up the anchor, only to see many of its customers sail away."
a. In behavioral economics, what is an "anchor"?
b. In what sense did Penney "pull up the anchor"?
c. Why did Penney follow this strategy, and what was the result?

Critical Thinking Exercises

CT10.1 You're in a store like REI, Cabela's, or Bass Pro Shops that specializes in selling outdoor clothing and accessories. On the front of a rack of rain jackets, you see one with a price tag of $400 and think:

> Why does the store even put this jacket on the rack? Hardly anyone would pay that much for just a rain jacket. Doesn't the store understand opportunity cost? By putting that jacket on the rack, it doesn't have room for an affordable jacket that more customers are likely to buy.

Identify the concept from this chapter that can explain why the store puts such an expensive jacket on a rack.

CT10.2 You are talking to a recently retired person who saved for years in order to travel and see the world. The more this person travels, the happier he is. Does this observation mean that the *law of diminishing marginal utility* is wrong? Briefly explain.

CT10.3 For this exercise, your instructor may assign you to a group. Each member of each group should think of an example of when he or she has experienced one of the "pitfalls in decision making" described in Section 10.4 and write down the example. Next, the group members should share their examples with each other. Finally, someone in the group should write a brief report of about a page that summarizes the pitfalls that members of the group have experienced and explains how avoiding these pitfalls would improve decision making.

Appendix

LEARNING OBJECTIVE: Use indifference curves and budget lines to understand consumer behavior.

Using Indifference Curves and Budget Lines to Understand Consumer Behavior

Consumer Preferences

In this chapter, we analyzed consumer behavior using the assumption that satisfaction, or *utility*, can be measured in utils. Although this assumption made our analysis easier to understand, it is unrealistic. In this appendix, we use the more realistic assumption that consumers are able to *rank* different combinations of goods and services in terms of how much utility they provide. For example, a consumer is able to determine whether he or she prefers 2 slices of pizza and 1 can of Coke or 1 slice of pizza and 2 cans of Coke, even if the consumer is unsure exactly how much utility he or she would receive from consuming these goods. This approach has the advantage of allowing us to actually draw a map of a consumer's preferences.

To begin with, suppose that a consumer is presented with the following alternatives, or *consumption bundles*:

Consumption Bundle *A*	Consumption Bundle *B*
2 slices of pizza and 1 can of Coke	1 slice of pizza and 2 cans of Coke

We assume that the consumer will always be able to decide which of the following is true:

- The consumer prefers bundle *A* to bundle *B*.
- The consumer prefers bundle *B* to bundle *A*.
- The consumer is indifferent between bundle *A* and bundle *B*. That is, the consumer would be equally happy to receive either bundle, so we can say that the consumer receives equal utility from the two bundles.

For consistency, we also assume that the consumer's preferences are *transitive*. For example, if a consumer prefers pepperoni pizza to mushroom pizza and prefers mushroom pizza to anchovy pizza, the consumer must prefer pepperoni pizza to anchovy pizza.

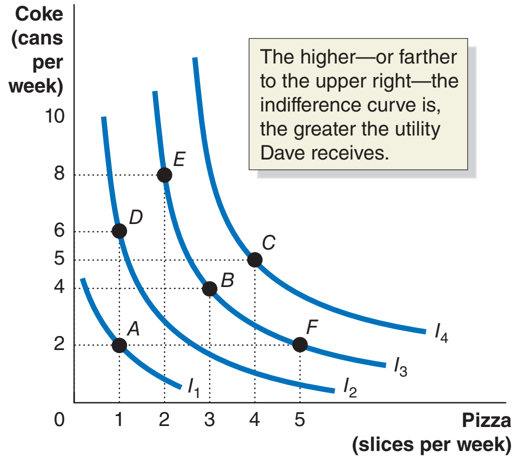
Indifference Curves

Indifference curve A curve that shows the combinations of consumption bundles that give the consumer the same utility.

Given the assumptions in the preceding section, we can draw a map of a consumer's preferences by using indifference curves. An **indifference curve** shows combinations of consumption bundles that give the consumer the same utility. In reality, consumers choose among consumption bundles containing many goods and services, but to make the discussion easier to follow, we will assume that only two goods are involved. Nothing important would change if we expanded the discussion to include many goods instead of just two.

The table in Figure 10A.1 gives Dave's preferences for pizza and Coke. The graph plots the information from the table. Every possible combination of pizza and Coke will have an indifference curve passing through it, although in the figure we have shown only four of Dave's indifference curves. Dave is indifferent among all the consumption

Consumption Bundle	Slices of Pizza	Cans of Coke
A	1	2
B	3	4
C	4	5
D	1	6
E	2	8
F	5	2



The higher—or farther to the upper right—the indifference curve is, the greater the utility Dave receives.

Figure 10A.1

Plotting Dave's Preferences for Pizza and Coke

Every possible combination of pizza and Coke will have an indifference curve passing through it, although in the graph we show just four of Dave's indifference curves. Dave is indifferent among all the consumption bundles that are on the same indifference curve. So, he is indifferent among bundles *E*, *B*, and *F* because they all lie on indifference curve I_3. Moving to the upper right in the graph increases the quantities of both goods available for Dave to consume. Therefore, the farther to the upper right the indifference curve is, the greater the utility Dave receives.

bundles that are on the same indifference curve. So, he is indifferent among bundles *E*, *B*, and *F* because they all lie on indifference curve I_3. Even though Dave has 4 fewer cans of Coke with bundle *B* than with bundle *E*, the additional slice of pizza he has in bundle *B* results in his having the same amount of utility at both points.

Even without looking at Dave's indifference curves, we know he will prefer consumption bundle *D* to consumption bundle *A* because in *D* he receives the same quantity of pizza as in *A* but 4 additional cans of Coke. But we need to know Dave's preferences, as shown by his indifference curves, to know how he will rank bundle *B* and bundle *D*. Bundle *D* contains more Coke but less pizza than bundle *B*, so Dave's ranking will depend on how much pizza he would be willing to give up to receive more Coke. The higher the indifference curve—that is, the farther to the upper right on the graph—the greater the amounts of both goods that are available for Dave to consume and the greater his utility. In other words, Dave receives more utility from the consumption bundles on indifference curve I_2 than from the consumption bundles on indifference curve I_1, more utility from the bundles on I_3 than from the bundles on I_2, and so on.

The Slope of an Indifference Curve

Remember that the slope of a curve is the ratio of the change in the variable on the vertical axis to the change in the variable on the horizontal axis. Along an indifference curve, the slope tells us the rate at which the consumer is willing to trade off one product for another while keeping the consumer's utility constant. Economists call this rate the **marginal rate of substitution (*MRS*)**.

Marginal rate of substitution (*MRS*) The rate at which a consumer would be willing to trade off one good for another.

We expect that the *MRS* will change as we move down an indifference curve. In Figure 10A.1, at a point like *E* on indifference curve I_3, Dave's indifference curve is relatively steep. As we move down the curve, it becomes less steep, until it becomes relatively flat at a point like *F*. This is the usual shape of indifference curves: They are bowed in, or convex. A consumption bundle like *E* contains a lot of Coke and not much pizza. We would expect that Dave could give up a significant quantity of Coke for a smaller quantity of additional pizza and still have the same level of utility. Therefore, the *MRS* will be high. As we move down the indifference curve, Dave moves to bundles, like *B* and *F*, that have more pizza and less Coke. At those points, Dave is willing to trade less Coke for pizza, and the *MRS* declines.

Can Indifference Curves Ever Cross?

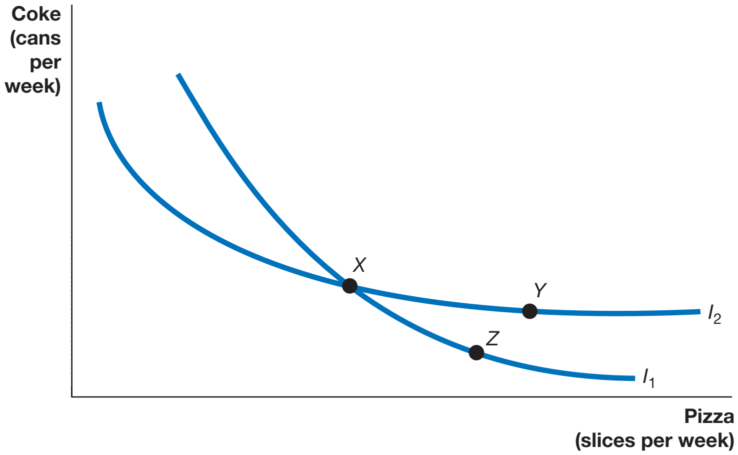
Remember that we assume that consumers have transitive preferences. That is, if Dave prefers consumption bundle *X* to consumption bundle *Y* and prefers consumption bundle *Y* to consumption bundle *Z*, he must prefer bundle *X* to bundle *Z*. If indifference curves cross, this assumption is violated. To understand why, look at Figure 10A.2, which shows two of Dave's indifference curves crossing.

Because bundle *X* and bundle *Z* are both on indifference curve I_1, Dave must be indifferent between them. Similarly, because bundle *X* and bundle *Y* are on indifference curve

Figure 10A.2

Indifference Curves Cannot Cross

Because bundle X and bundle Z are both on indifference curve I_1, Dave must be indifferent between them. Similarly, because bundle X and bundle Y are on indifference curve I_2, Dave must be indifferent between them. The assumption of transitivity means that Dave should also be indifferent between bundle Z and bundle Y. We know he won't be, however, because bundle Y contains more pizza and more Coke than bundle Z. So, Dave will definitely prefer bundle Y to bundle Z, which violates the assumption of transitivity. Therefore, none of Dave's indifference curves can cross.



I_2, Dave must be indifferent between them. The assumption of transitivity means that Dave should also be indifferent between bundle Z and bundle Y. We know he won't be, however, because bundle Y contains more pizza and more Coke than bundle Z. So, Dave will definitely prefer bundle Y to bundle Z, which violates the assumption of transitivity. Therefore, none of Dave's indifference curves can cross.

The Budget Constraint

Remember that a consumer's *budget constraint* is the amount of income he or she has available to spend on goods and services. Suppose that Dave has \$10 per week to spend on pizza and Coke. The table in Figure 10A.3 shows the combinations that he can afford to buy if the price of pizza is \$2 per slice and the price of Coke is \$1 per can. As you can see, all the points lie on a straight line. This line represents Dave's budget constraint. The line intersects the vertical axis at the maximum number of cans of Coke Dave can afford to buy with \$10, which is consumption bundle G. The line intersects the horizontal axis at the maximum number of slices of pizza Dave can afford to buy with \$10, which is consumption bundle L. As he moves down his budget constraint from bundle G, he gives up 2 cans of Coke for every slice of pizza he buys.

Any consumption bundle along the line or inside the line is *affordable* for Dave because he has the income to buy those combinations of pizza and Coke. Any bundle that lies outside the line is *unaffordable* because those bundles cost more than the income Dave has available to spend.

The slope of the budget constraint is constant because the budget constraint is a straight line. The slope of the line equals the change in the number of cans of Coke divided by the change in the number of slices of pizza. In this case, moving down the budget constraint from one point to another point, the change in the number of cans of Coke equals -2, and the change in the number of slices of pizza equals 1, so the slope equals $-2 / 1$, or -2. Notice that with the price of pizza equal to \$2 per slice and the price of Coke equal to \$1 per can, the slope of the budget constraint is equal to the ratio of the price of pizza to the price of Coke (multiplied by -1). In fact, this result will always hold: *The slope of the budget constraint is equal to the ratio of the price of the good on the horizontal axis divided by the price of the good on the vertical axis multiplied by* -1.

Choosing the Optimal Consumption of Pizza and Coke

Dave would like to be on the highest possible indifference curve because higher indifference curves represent more pizza and more Coke. But Dave can only buy the bundles that lie on or inside his budget constraint. In other words, *to maximize utility, a consumer needs to be on the highest indifference curve, given his budget constraint.*

Combinations of Pizza and Coke Dave Can Buy with $10

Consumption Bundle	Slices of Pizza	Cans of Coke	Total Spending
G	0	10	$10
H	1	8	10
I	2	6	10
J	3	4	10
K	4	2	10
L	5	0	10

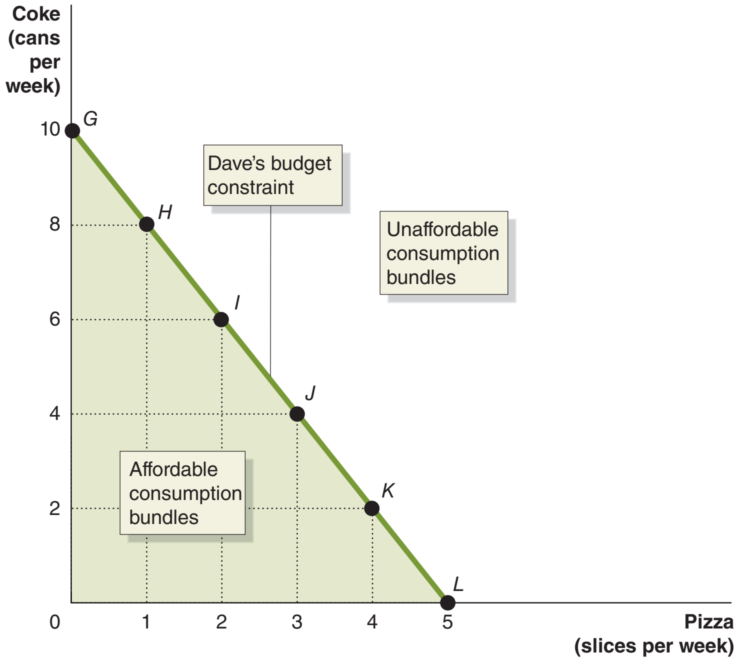


Figure 10A.3

Dave's Budget Constraint

Dave's budget constraint shows the combinations of slices of pizza and cans of Coke he can buy with $10. The price of Coke is $1 per can, so if he spends all of his $10 on Coke, he can buy 10 cans (bundle *G*). The price of pizza is $2 per slice, so if he spends all of his $10 on pizza, he can buy 5 slices (bundle *L*). As he moves down his budget constraint from bundle *G*, he gives up 2 cans of Coke for every slice of pizza he buys. Any consumption bundles along the line or inside the line are affordable. Any bundles that lie outside the line are unaffordable.

Figure 10A.4 plots the consumption bundles from Figure 10A.1 along with the budget constraint from Figure 10A.3. The figure also shows the indifference curves that pass through each consumption bundle. In Figure 10A.4, the highest indifference curve

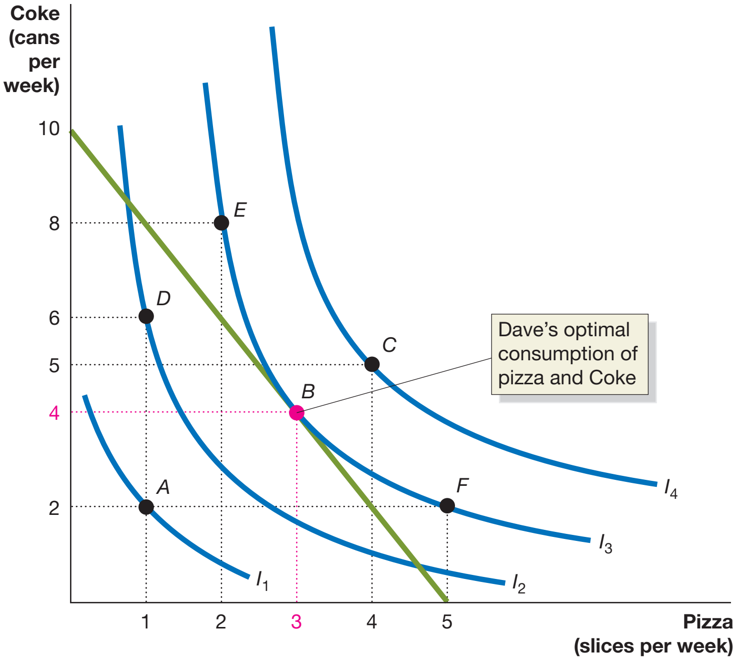


Figure 10A.4

Finding Optimal Consumption

Dave would like to be on the highest possible indifference curve, but he cannot reach indifference curves such as I_4 that are outside his budget constraint. Dave's optimal combination of slices of pizza and cans of Coke is at point *B*, where his budget constraint just touches—or is *tangent* to—the highest indifference curve he can reach. At point *B*, he buys 3 slices of pizza and 4 cans of Coke.

shown is I_4. Unfortunately, Dave lacks the income to purchase consumption bundles—such as *C*—that lie on I_4. He has the income to purchase bundles such as *A* and *D*, but he can do better. If he consumes bundle *B*, he will be on the highest indifference curve he can reach, given his budget constraint of $10. The resulting combination of 3 slices of pizza and 4 cans of Coke represents Dave's optimal consumption of pizza and Coke, given his preferences and his budget constraint. Notice that at point *B*, Dave's budget constraint just touches—or is *tangent* to—I_3. In fact, bundle *B* is the only bundle on I_3 that Dave is able to purchase for $10.

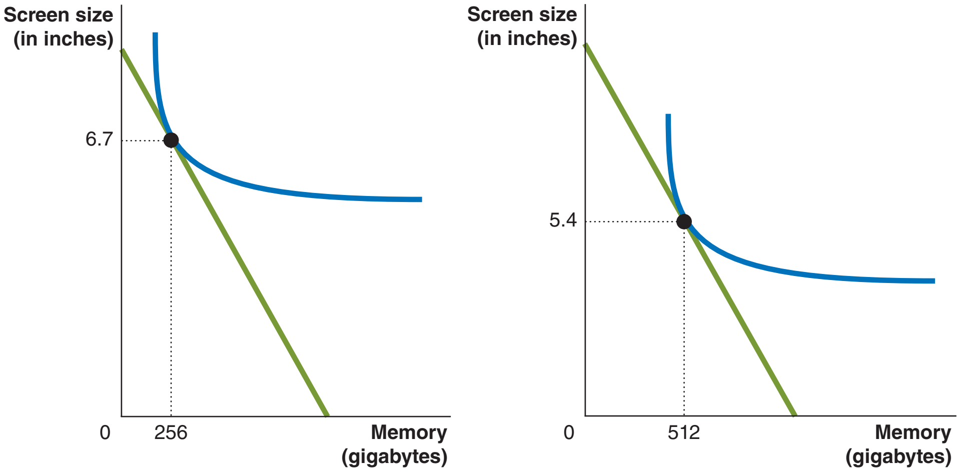
Apply the Concept

Apple Determines the Optimal Mix of iPhone Features

Consumers have different preferences, which helps explain why many firms offer products with a variety of features. For example, Apple sells its iPhones with different screen sizes, processors, displays, cameras, battery lives, and amounts of memory. We can use the model of consumer choice to analyze a simplified version of the situation managers at Apple face in deciding which features to offer consumers.

Assume that consumers have $800 each to spend on an iPhone and that they are concerned with only two smartphone features: screen size and memory. Because larger screens and larger memories increase Apple's cost of producing smartphones, consumers face a trade-off: If they stay within their $800 budget, the larger the screen they choose, the smaller the amount of memory they get—and vice versa. Consumers in panel (a) of the following figure prefer screen size to memory. For this group, the point of tangency between a typical consumer's indifference curve and the budget constraint shows an optimal choice of a 6.7-inch screen and 256 gigabytes (GB) of memory. Consumers in panel (b) prefer memory to screen size. For this group, the point of tangency between a typical consumer's indifference curve and the budget constraint shows an optimal choice of a 5.4-inch screen and 512 GB of memory.

Apple and other companies use market research methods such as surveys and focus groups to gather information about consumer preferences. With knowledge of consumers' preferences and data on the costs of producing different smartphone components, Apple can determine the mix of features to offer consumers.



(a) Consumers who prefer screen size to memory capacity

(b) Consumers who prefer memory capacity to screen size

Your Turn: Test your understanding by doing related problem 10A.8 at the end of this appendix.

Deriving the Demand Curve

Suppose the price of pizza falls from $2 per slice to $1 per slice. How will this change affect Dave's decision about which combination of pizza and Coke is optimal? First, notice what happens to Dave's budget constraint when the price of pizza falls. As Figure 10A.5 shows, when the price of pizza is $2 per slice, the maximum number of slices Dave can buy is 5. After the price of pizza falls to $1 per slice, Dave can buy a maximum of 10 slices. His budget constraint rotates outward from point *A* to point *B* to represent this. (Notice that the fall in the price of pizza does not affect the maximum number of cans of Coke Dave can buy with his $10.)

When his budget constraint rotates outward, Dave is able to purchase consumption bundles that were previously unaffordable. Panel (a) of Figure 10A.6 shows that the combination of 3 slices of pizza and 4 cans of Coke was optimal when the price of pizza was $2 per slice, but the combination of 7 slices of pizza and 3 cans of Coke is optimal when the price of pizza falls to $1. The lower price of pizza causes Dave to consume more pizza and less Coke and to end up on a higher indifference curve.

The change in Dave's optimal consumption of pizza as the price changes explains why demand curves slope downward. Dave adjusted his consumption of pizza as follows:

Price of pizza = $2 per slice → Quantity of pizza demanded = 3 slices

Price of pizza = $1 per slice → Quantity of pizza demanded = 7 slices

In panel (b) of Figure 10A.6, we plot the two points of optimal consumption and draw a line to connect the points. This downward-sloping line is Dave's demand curve for pizza. We could find more points on the demand curve by changing the price of pizza and finding the new optimal number of slices of pizza Dave would demand.

Remember that according to the law of demand, demand curves always slope downward. We have just shown that the law of demand results from the optimal adjustment by consumers to changes in prices. A fall in the price of a good will rotate *outward* the budget constraint and make it possible for a consumer to reach higher indifference

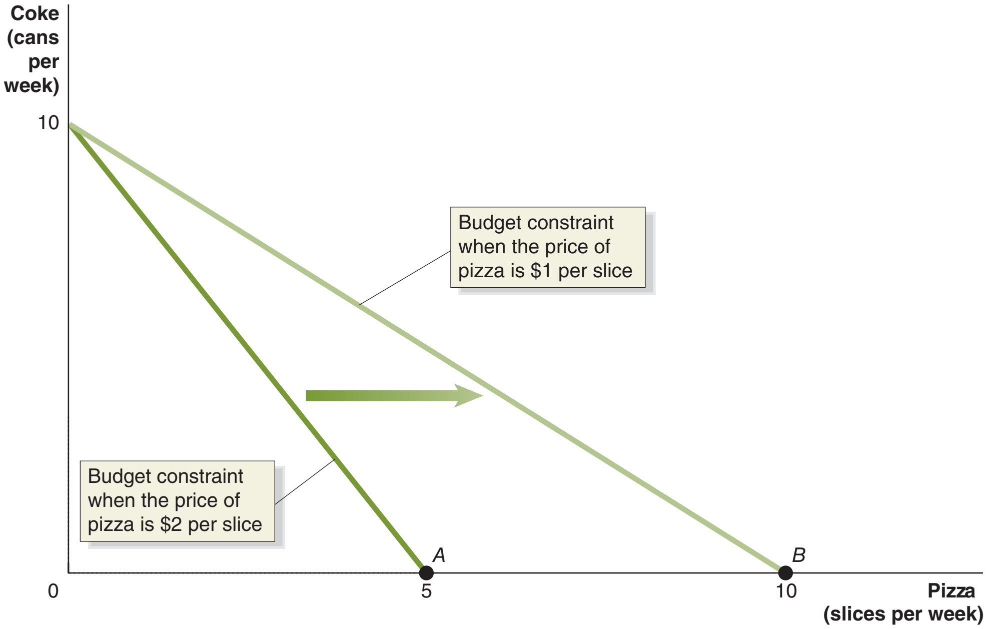


Figure 10A.5 **How a Price Decrease Affects the Budget Constraint**

A fall in the price of pizza from $2 per slice to $1 per slice increases the maximum number of slices Dave can buy with $10 from 5 to 10. The budget constraint rotates outward from point *A* to point *B* to show the effect of the price decrease.

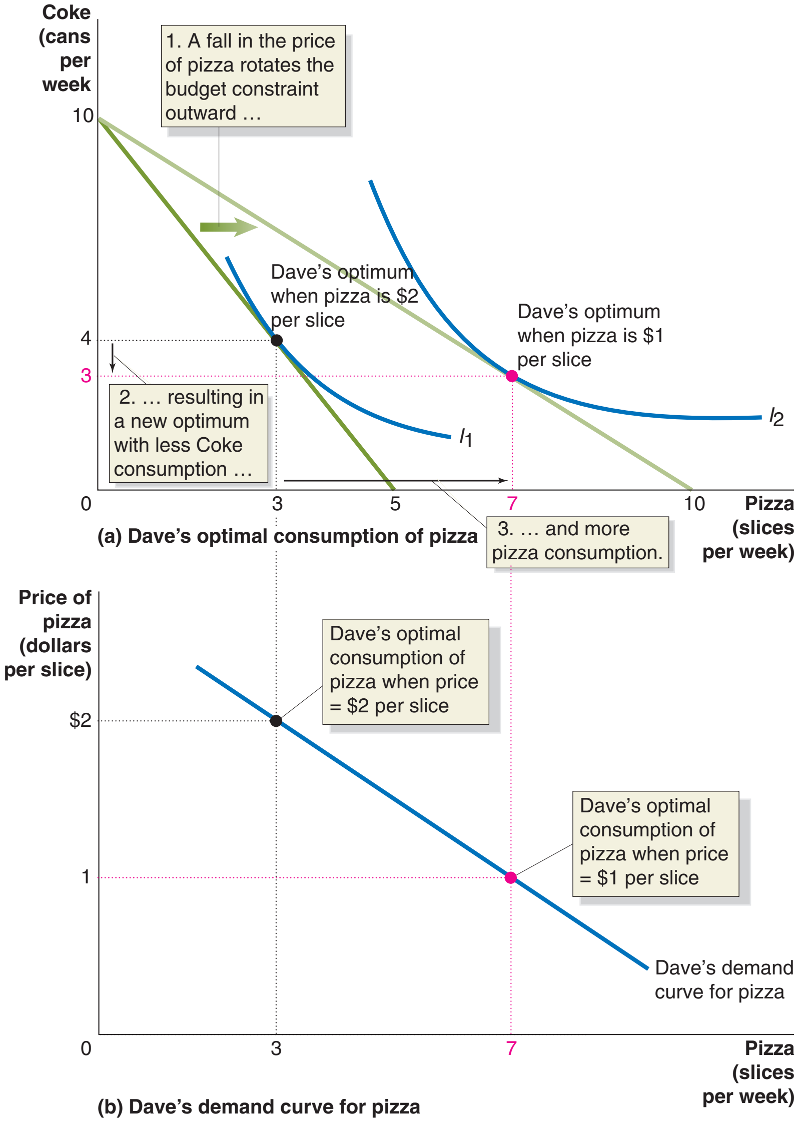
Figure 10A.6

How a Price Change Affects Optimal Consumption

In panel (a), a fall in the price of pizza results in Dave's consuming less Coke and more pizza:

1. A fall in the price of pizza rotates the budget constraint outward because Dave can now buy more pizza with his $10.
2. In the new optimum on indifference curve I_2, Dave changes the quantities he consumes of both goods. His consumption of Coke falls from 4 cans to 3 cans.
3. In the new optimum, Dave's consumption of pizza increases from 3 slices to 7 slices.

In panel (b), Dave responds optimally to the fall in the price of pizza from $2 per slice to $1 per slice by increasing the quantity of slices he consumes from 3 slices to 7 slices. When we graph this result, we have Dave's demand curve for pizza.



curves. As a result, the consumer will increase the quantity of the good demanded. An increase in price will rotate *inward* the budget constraint and force the consumer to a lower indifference curve. As a result, the consumer will decrease the quantity of the good demanded.

Solved Problem 10A.1

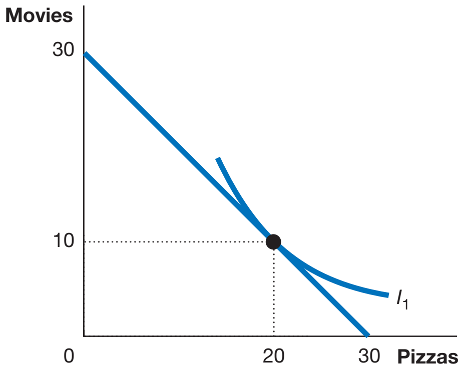
When Does a Price Change Make a Consumer Better Off?

Dave has $300 to spend each month on pizzas and streaming movies. Pizzas and movies both have a price of $10, and Dave is maximizing his utility by buying 20 pizzas and 10 movies. Suppose Dave still has $300 to spend, but the price of movies rises to $20, while the price of pizzas drops to $5. Is Dave better or worse off than he was before the price change? Use a budget constraint–indifference curve graph to illustrate your answer.

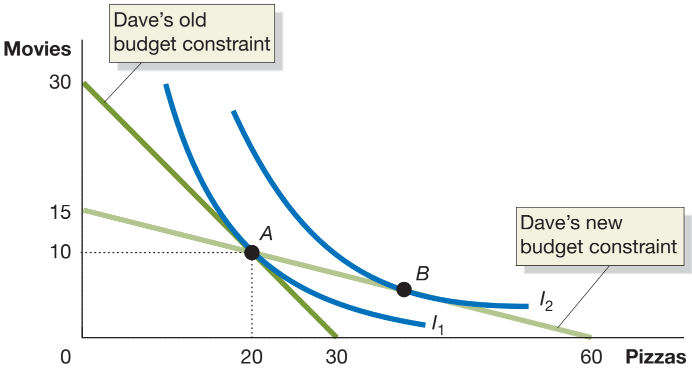
Solving the Problem

Step 1: Review the chapter material. This problem concerns the effect of price changes on optimal consumption, so you may want to review the section "Deriving the Demand Curve."

Step 2: Solve the problem by drawing the appropriate graph. Begin by drawing the budget constraint, indifference curve, and point of optimal consumption for the original prices:



Now draw a graph that shows the results of the price changes. Notice that in this problem, the prices of *both* goods change. You can determine the position of the new budget constraint by calculating the maximum quantity of pizzas and movies Dave can buy after the price changes. You should also note that after the price changes, Dave can still buy his original optimal consumption bundle—20 pizzas and 10 movies—by spending all of his $300, so his new budget constraint must pass through this point.



At the new prices, Dave can buy a maximum of 60 pizzas or 15 movies. Both his old and new budget constraints pass through the consumption bundle at point *A*. This consumption bundle is no longer optimal, however, because with the new prices, it is possible for him to reach an indifference curve that is higher than I_1. We can draw in the new highest indifference curve he can reach—I_2—and show the new optimal consumption bundle—point *B*.

Because Dave can now reach a higher indifference curve, we can conclude that he is better off as a result of the price change.

Your Turn: For more practice, do related problem 10A.10 at the end of this appendix.

The Income Effect and the Substitution Effect of a Price Change

We saw in this chapter that a price change has these two effects on the quantity of a good consumed:

1. The *income effect* is the change in the quantity demanded of a good that results from the effect of a change in price on consumer purchasing power, holding all other factors constant.

2. The *substitution effect* is the change in the quantity demanded of a good that results from a change in price making the good more or less expensive relative to other goods, holding constant the effect of the price change on consumer purchasing power.

We can use indifference curves and budget constraints to analyze these two effects more precisely.

Figure 10A.7 illustrates the same situation shown in Figure 10A.6: The price of pizza has fallen from \$2 per slice to \$1 per slice, and Dave's budget constraint has rotated outward. As before, Dave's optimal consumption of pizza increases from 3 slices per week (point *A* in Figure 10A.7) to 7 slices per week (point *C*). We can think of this movement from point *A* to point *C* as taking place in two steps: The movement from point *A* to point *B* represents the substitution effect, and the movement from point *B* to point *C* represents the income effect. To isolate the substitution effect, we have to hold constant the effect of the price change on Dave's income. We do this by changing the price of pizza relative to the price of Coke *but at the same time holding his utility constant by keeping Dave on the same indifference curve*. In Figure 10A.7, in moving from point *A* to point *B*, he remains on indifference curve I_1. Point *A* is a point of tangency between I_1 and his original budget constraint. Point *B* is a point of tangency between I_1 and a new, *hypothetical* budget constraint that has a slope equal to the new ratio of the price of pizza to the price of Coke. At point *B*, Dave has increased his consumption of pizza from 3 slices to 5 slices. Because we are still on indifference curve I_1, we know that this increase is his response only to the change in the relative price of pizza and, therefore, that the increase represents the substitution effect of the fall in the price of pizza.

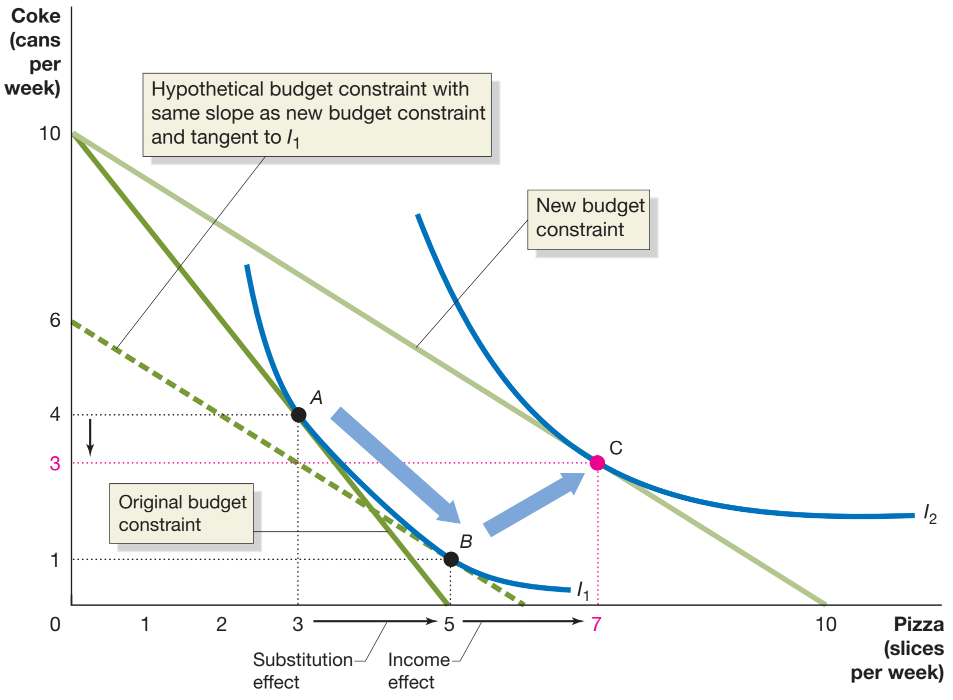
At point *B*, Dave has not spent all his income. Remember that the fall in the price of pizza has increased Dave's purchasing power. In Figure 10A.7, we illustrate the additional pizza he consumes because of the income effect of increased purchasing power by the movement from point *B* to point *C*. Notice that in moving from point *B* to point *C*, the price of pizza relative to the price of Coke is constant because the slope of the new budget constraint is the same as the slope of the hypothetical budget constraint that is tangent to I_1 at point *B*.

We can conclude that Dave increases his consumption of pizza from 3 slices per week to 5 slices per week because of the substitution effect of a fall in the price of pizza and from 5 slices per week to 7 slices per week because of the income effect. Recall from our discussion of income and substitution effects in this chapter that the income effect

Figure 10A.7

Income and Substitution Effects of a Price Change

Following a decline in the price of pizza, Dave's optimal consumption of pizza increases from 3 slices per week (point *A*) to 7 slices per week (point *C*). We can think of this movement from point *A* to point *C* as taking place in two steps: The movement from point *A* to point *B* along indifference curve I_1 represents the substitution effect, and the movement from point *B* to point *C* represents the income effect. Dave increases his consumption of pizza from 3 slices per week to 5 slices per week because of the substitution effect of a fall in the price of pizza and from 5 slices per week to 7 slices per week because of the income effect.



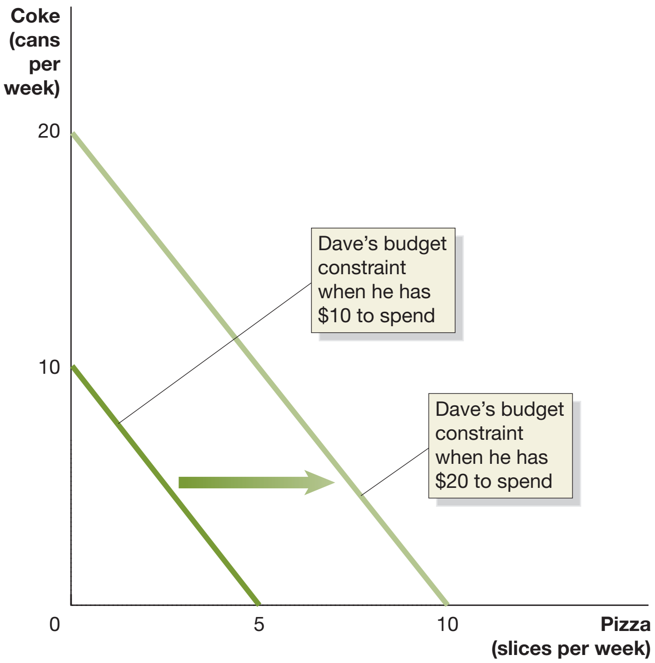


Figure 10A.8

How a Change in Income Affects the Budget Constraint

When the income Dave has to spend on pizza and Coke increases from $10 to $20, his budget constraint shifts outward. With $10, Dave could buy a maximum of 5 slices of pizza or 10 cans of Coke. With $20, he can buy a maximum of 10 slices of pizza or 20 cans of Coke.

of a price decline causes consumers to buy more of a normal good and less of an inferior good. Because the income effect causes Dave to increase his consumption of pizza, pizza must be a normal good for him.

How a Change in Income Affects Optimal Consumption

Suppose that the price of pizza remains at $2 per slice, but the income Dave has to spend on pizza and Coke increases from $10 to $20. Figure 10A.8 shows how this change affects his budget constraint. With an income of $10, Dave could buy a maximum of 5 slices of pizza or 10 cans of Coke. With an income of $20, he can buy 10 slices of pizza or 20 cans of Coke. The additional income allows Dave to increase his consumption of both pizza and Coke and to move to a higher indifference curve.

Figure 10A.9 shows Dave's new optimum. He is able to increase his consumption of pizza from 3 to 7 slices per week and his consumption of Coke from 4 to 6 cans per week.

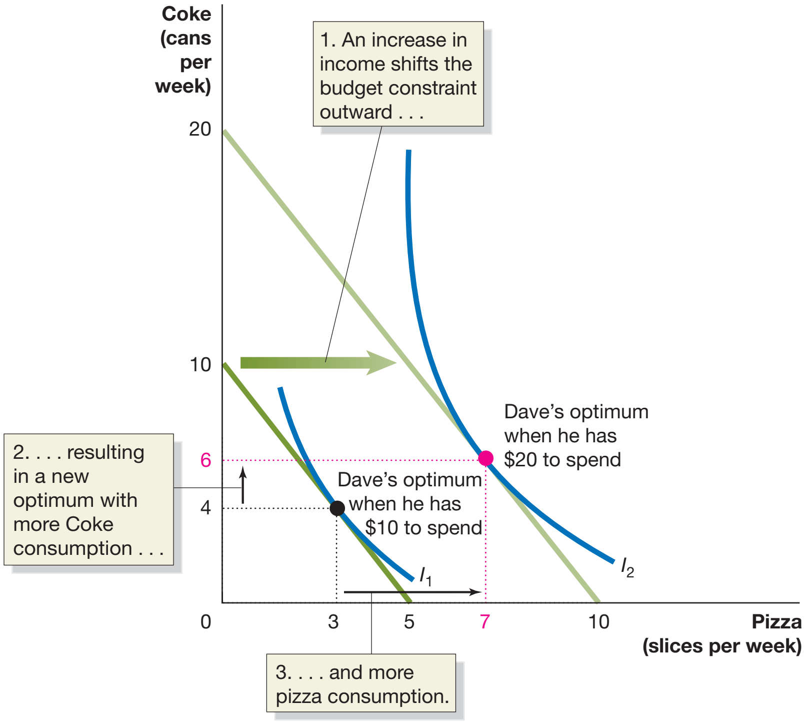


Figure 10A.9

How a Change in Income Affects Optimal Consumption

An increase in income leads Dave to consume more Coke and more pizza:

1. An increase in income shifts Dave's budget constraint outward because he can now buy more of both goods.
2. In the new optimum on indifference curve I_2, Dave changes the quantities he consumes of both goods. His consumption of Coke increases from 4 to 6 cans.
3. In the new optimum, Dave's consumption of pizza increases from 3 to 7 slices.

The Slope of the Indifference Curve, the Slope of the Budget Line, and the Rule of Equal Marginal Utility per Dollar Spent

In this chapter, we saw that consumers maximize utility when they consume each good up to the point where the marginal utility per dollar spent is the same for every good. This condition seems different from the one we stated earlier in this appendix that to maximize utility, a consumer needs to be on the highest indifference curve possible, given his budget constraint. In fact, the two conditions are equivalent. To see this, begin by looking at Figure 10A.10, which again combines Dave's indifference curve and budget constraint. Remember that at the point of optimal consumption, the indifference curve and the budget constraint are tangent, so they have the same slope. Therefore, *at the point of optimal consumption, the marginal rate of substitution* (MRS) *is equal to the ratio of the price of the product on the horizontal axis to the price of the product on the vertical axis.*

The slope of the indifference curve tells us the rate at which a consumer is *willing* to trade off one good for the other. The slope of the budget constraint tells us the rate at which a consumer is *able* to trade off one good for the other. Only at the point of optimal consumption is the rate at which a consumer is willing to trade off one good for the other equal to the rate at which the consumer can trade off one good for the other.

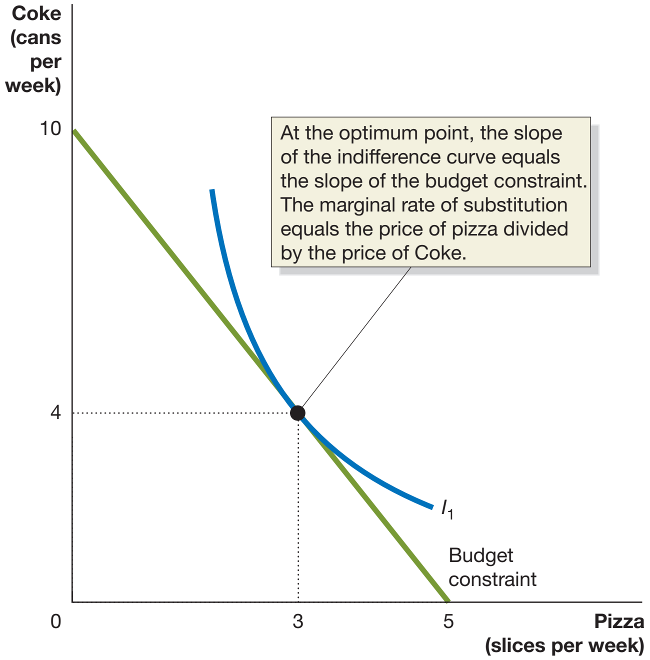
The Rule of Equal Marginal Utility per Dollar Spent Revisited

Recall from this chapter the *rule of equal marginal utility per dollar*, which states that to maximize utility, consumers should spend their income so that the last dollar spent on each product gives them the same marginal utility. We can use our indifference curve and budget constraint analysis to see why this rule holds. When we move from one point on an indifference curve to another, we end up with more of one product and less of the other product but the same amount of utility. For example, as Dave moves down an indifference curve, he consumes less Coke and more pizza, but he has the same amount of utility.

Figure 10A.10

At the Optimum Point, the Slopes of the Indifference Curve and Budget Constraint Are the Same

At the point of optimal consumption, the marginal rate of substitution is equal to the ratio of the price of the product on the horizontal axis to the price of the product on the vertical axis.



Remember that marginal utility (*MU*) tells us how much additional utility a consumer gains (or loses) from consuming more (or less) of a good. So, when Dave consumes less Coke by moving down an indifference curve, he loses utility equal to:

$$-\text{Change in the quantity of Coke} \times MU_{Coke},$$

but he consumes more pizza, so he gains utility equal to:

$$\text{Change in the quantity of pizza} \times MU_{Pizza}.$$

We know that the gain in utility from the additional pizza is equal to the loss from the smaller quantity of Coke because Dave's total utility remains the same along an indifference curve. Therefore, we can write:

$$\underbrace{-(\text{Change in the quantity of Coke} \times MU_{Coke})}_{\text{Loss in utility from consuming less Coke}} = \underbrace{(\text{Change in the quantity of pizza} \times MU_{Pizza})}_{\text{Gain in utility from consuming more pizza}}.$$

If we rearrange terms, we have:

$$\frac{-\text{Change in the quantity of Coke}}{\text{Change in the quantity of pizza}} = \frac{MU_{Pizza}}{MU_{Coke}}.$$

Because the expression:

$$\frac{-\text{Change in the quantity of Coke}}{\text{Change in the quantity of pizza}}$$

is the slope of the indifference curve, it is equal to the *MRS* (multiplied by -1). So, we can write:

$$\frac{-\text{Change in the quantity of Coke}}{\text{Change in the quantity of pizza}} = MRS = \frac{MU_{Pizza}}{MU_{Coke}}.$$

The slope of Dave's budget constraint equals the price of pizza divided by the price of Coke (multiplied by -1). We saw earlier in this appendix that at the point of optimal consumption, the *MRS* equals the ratio of the prices of the two goods. Therefore:

$$\frac{MU_{Pizza}}{MU_{Coke}} = \frac{P_{Pizza}}{P_{Coke}}.$$

We can rewrite this to show that at the point of optimal consumption:

$$\frac{MU_{Pizza}}{P_{Pizza}} = \frac{MU_{Coke}}{P_{Coke}}.$$

This last expression is the rule of equal marginal utility per dollar that we first developed in this chapter. So we have shown how this rule follows from the indifference curve and budget constraint approach to analyzing consumer choice.

Key Terms

Indifference curve, p. 370

Marginal rate of substitution (*MRS*), p. 371

10A Using Indifference Curves and Budget Lines to Understand Consumer Behavior

LEARNING OBJECTIVE: Use indifference curves and budget lines to understand consumer behavior.

Review Questions

10A.1 What are the two assumptions economists make about consumer preferences?

10A.2 What is an indifference curve? What is a budget constraint?

10A.3 Briefly explain which of the following statements best describes the conditions for a consumer to maximize utility when buying two goods.

1. The consumer should buy the maximum available amount of both goods.
2. The consumer should be on the highest indifference curve possible, given her budget constraint.
3. The consumer should be on the lowest indifference curve possible, given her budget constraint.
4. The consumer should buy equal quantities of both goods.

Problems and Applications

10A.4 Jacob receives an allowance of $5 per week. He spends all his allowance on ice cream cones and bottles of smartwater.

- **a.** If the price of ice cream cones is $0.50 per cone and the price of bottles of smartwater is $1 per bottle, draw a graph showing Jacob's budget constraint. Be sure to indicate on the graph the maximum number of ice cream cones and the maximum number of bottles of smartwater that Jacob can buy.
- **b.** Jacob buys 8 ice cream cones and 1 bottle of smartwater. Draw an indifference curve representing Jacob's choice, assuming that he has chosen the optimal combination.
- **c.** Suppose that the price of ice cream cones rises to $1 per cone. Draw Jacob's new budget constraint and his new optimal consumption of ice cream cones and bottles of smartwater.

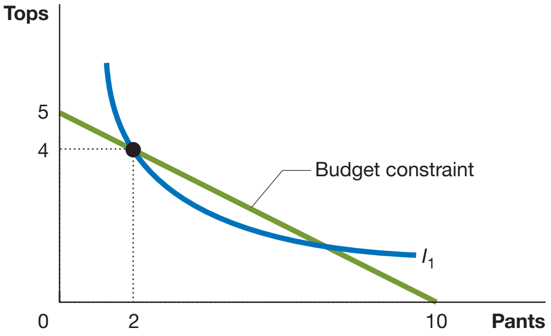
10A.5 Suppose that Jacob's allowance in problem 10A.4 climbs from $5 to $10 per week.

- **a.** Show how the increased allowance alters Jacob's budget constraint.
- **b.** Draw a set of indifference curves that show how Jacob's choice of ice cream cones and bottles of smartwater changes when his allowance increases. Assume that both goods are normal.
- **c.** Draw a set of indifference curves that show how Jacob's choice of ice cream cones and bottles of smartwater changes when his allowance increases. Assume that smartwater is a normal good but ice cream is an inferior good.

10A.6 Suppose that Calvin considers Pepsi and Coke to be perfect substitutes. They taste the same to him, and he gets exactly the same amount of enjoyment from drinking a can of Pepsi or a can of Coke.

- **a.** Will Calvin's indifference curves showing his trade-off between Pepsi and Coke have the same curvature as the indifference curves drawn in the figures in this appendix? Briefly explain.
- **b.** How will Calvin decide whether to buy Pepsi or Coke?

10A.7 In the following budget constraint–indifference curve graph, Nikki has $200 to spend on tops and pants.



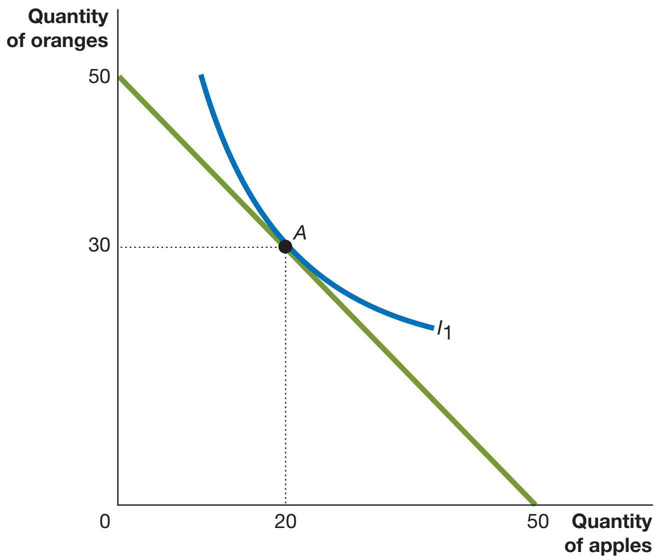
- **a.** What is the price of tops? What is the price of pants?
- **b.** Is Nikki making the optimum choice if she buys 4 tops and 2 pairs of pants? Explain how you know this.

10A.8 **[Related to the Apply the Concept "Apple Determines the Optimal Mix of iPhone Features"]** Marilou and Hunter both purchase milk and doughnuts at the same Quik Mart. They have different tastes for milk and doughnuts and different incomes. They both buy some milk and some doughnuts, but they buy considerably different quantities of the two goods. Can we conclude that their marginal rate of substitution between milk and doughnuts is the same? Draw a graph that shows their budget constraints and indifference curves and explain.

10A.9 Sunsweet decides that prune juice has a bad image, so it launches a slick advertising campaign to convince young people that prune juice is very hip. The company hires Taylor Swift, Beyoncé, and Bruno Mars to endorse its product. The campaign works! Prune juice sales soar, even though Sunsweet hasn't cut the price. Draw a budget constraint and indifference curve graph with Sunsweet prune juice on one axis and other drinks on the other axis and show how the celebrity endorsements have changed things.

10A.10 **[Related to Solved Problem 10A.1]** Dave has $300 to spend each month on pizzas and online movies. Pizzas and movies both currently have a price of $10, and Dave is maximizing his utility by buying 20 pizzas and 10 movies. Suppose he still has $300 to spend, but the price of a pizza rises to $12, while the price of a movie drops to $6. Is he better or worse off than he was before the price change? Use a budget constraint–indifference curve graph to illustrate your answer.

10A.11 The following graph illustrates the combination of apples and oranges (point *A*) that maximizes Yolanda's total utility, given her budget. Suppose the price of oranges doubles, while the price of apples and Yolanda's income both stay the same.

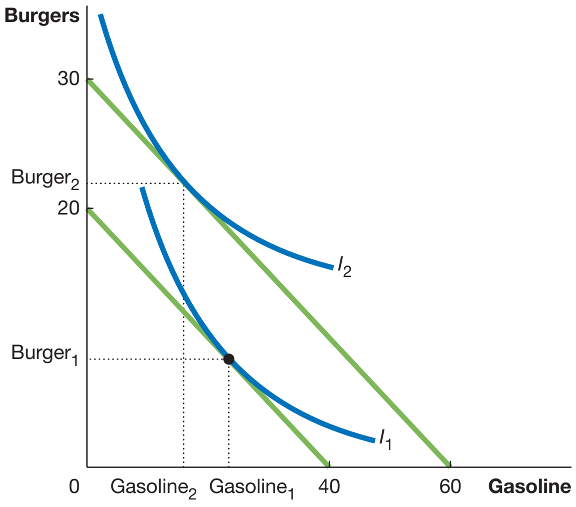


- **a.** Draw a new budget constraint to reflect the increase in the price of oranges.
- **b.** Based on the assumptions regarding consumer preferences listed at the beginning of this appendix, sketch in a new indifference curve to reflect the new optimal combination of apples and oranges now that the price of oranges has doubled.
- **c.** Are there any circumstances in which the new optimal combination of apples and oranges will include a larger quantity of oranges (compared to the original combination)? Briefly explain.

10A.12 An article in the *Wall Street Journal* noted that as a result of lower gasoline prices, sales "improved notably over the last two months at Back Yard Burgers, a dining chain based in Nashville, Tenn." A student is asked to use an indifference curve and budget constraint graph to show the effect on a consumer of lower gasoline prices, making the following assumptions:

1. The consumer has $120 per month to spend on gasoline and burgers.
2. The price of gasoline falls from $3 per gallon to $2 per gallon.
3. The price of burgers is unchanged, at $6.

The student draws the following graph.



Comment on whether the student has correctly drawn each of the following.

- **a.** The consumer's original budget constraint before the decline in the price of gasoline
- **b.** The consumer's budget constraint after the decline in the price of gasoline
- **c.** The change in the quantity of gasoline the consumer buys after the decline in the price of gasoline

11 Technology, Production, and Costs

ChatGPT and the Economic Consequences of Artificial Intelligence

Ismagilov/123RF

OpenAI is an artificial intelligence (AI) startup headquartered in San Francisco. In November 2022, OpenAI released ChatGPT, a generative AI program capable of quickly composing sophisticated answers to questions such as "What explains the success of the iPhone?" In early 2023, Microsoft, which had invested billions in OpenAI, began incorporating a modified version of ChatGPT in its Bing search engine. Microsoft hoped that ChatGPT would help it gain market share in the online search market dominated by Alphabet's Google search engine.

Sophisticated AI programs such as ChatGPT are called *chatbots*. As chatbots became widely available, high school teachers and college instructors wondered how they could tell whether writing assignments such as term papers were actually the work of students or whether they had been generated by chatbots. More broadly, many people worried that advances in AI would have very broad effects, potentially eliminating millions of current jobs in fields such as journalism, public relations, marketing, and communications that rely on employees' writing skills.

It's unclear whether chatbots will have an important effect on the economy. If they do, chatbots will be one of many examples of technological change affecting how people live and work and how firms produce goods and services. Chatbots are like other types of technological change that involve substituting capital—such as machinery, equipment, computers, and software—for labor. In the 1700s, one of the main developments when modern economic growth began during the Industrial Revolution was the introduction of machinery into the production of cotton textiles. Many workers who had been making cloth by hand using only simple tools lost their jobs. In more recent times, the increasing processing power of semiconductors enabled firms such as Apple and Dell to sell low-priced personal computers. Among other effects, these computers revolutionized corporate business offices, and many people working as typists, bookkeepers, and clerks lost their jobs.

As waves of technological change sweep over the economy, some jobs are destroyed and new ones are created. As jobs for typists and bookkeepers have disappeared, jobs for programmers and software developers have been created. Over the decades, the increase in the U.S. population has been matched by an equal increase in the number of available jobs, although the types of jobs have changed dramatically.

Competition among firms fuels the push to develop and use new technology. New technology typically increases the *productivity* of workers, or the amount of output that each worker can produce. Higher labor productivity reduces the cost of the output workers produce. Competition among firms ensures that cost reductions are passed on to consumers in the form of lower prices for the goods and services they buy. Increasing productivity is the key to rising living standards. Modern economic growth, which has led to the high standard of living enjoyed by people in the United States, Canada, Japan, the countries of Western Europe, and other high-income countries, has been made possible by technological change. Technological change has clearly been responsible both for great improvements in the well-being of the average person and also disruptions that have caused some people to at least temporarily lose their jobs and some firms to go out of business.

In this chapter, we'll begin analyzing the connection between a firm's technology and its cost of producing output. In Chapter 12, we'll see how the relationship between firms' costs and the prices for their products determines the quantities they produce and how profitable the firms are.

Chapter Outline & Learning Objectives

11.1 Technology: An Economic Definition, page 386
Define technology and give examples of technological change.

11.2 The Short Run and the Long Run in Economics, page 388
Distinguish between the economic short run and the economic long run.

11.3 The Marginal Product of Labor and the Average Product of Labor, page 391
Explain and illustrate the relationship between the marginal product of labor and the average product of labor.

11.4 The Relationship between Short-Run Production and Short-Run Cost, page 396
Explain and illustrate the relationship between marginal cost and average total cost.

11.5 Graphing Cost Curves, page 399
Graph average total cost, average variable cost, average fixed cost, and marginal cost.

11.6 Costs in the Long Run, page 402
Explain how firms use the long-run average cost curve in their planning.

Online Appendix: Using Isoquants and Isocost Lines to Understand Production and Cost
Use isoquants and isocost lines to understand production and cost.

Economics in Your Life & Career

Using Cost Concepts in Your Online Business

Suppose you are considering starting a website to sell iPhone cases. You locate a Taiwanese manufacturer who will sell you the cases for $10 each. Your friend José is already selling cases on his website, and you plan to buy the same computers and software that he uses. Like José, you intend to rent a small building in an industrial park where you can have an office and storage space for your inventory. You plan to sell the cases for $15 each, which is the same price José is selling his cases for. You find out that José is selling more cases per month than you expect to sell and that he is earning a greater profit on each case than you expect to earn. You wonder how José makes a greater profit on each case when he is charging the same price you expect to charge. Because José sells more cases per month, will his firm's costs be lower than your firm's costs? As you read the chapter, see if you can answer this question. You can check your answer against the one we provide at the end of this chapter.

In Chapter 10, we looked behind the demand curve to better understand consumer decision making. In this chapter, we look behind the supply curve to better understand firm decision making. Earlier chapters showed that supply curves are upward sloping because marginal cost increases as firms increase the quantity of a good that they supply. In this chapter, we look more closely at why this relationship between production and cost holds. With an understanding of production and cost, we can proceed in the following chapters to look at how firms decide what level of output to produce and what price to charge.

11.1 Technology: An Economic Definition

LEARNING OBJECTIVE: Define technology and give examples of technological change.

Technology The processes a firm uses to turn inputs into outputs of goods and services.

The basic activity of a firm is to use *inputs*, such as workers, machines, and natural resources, to produce *outputs* of goods and services. A pizza restaurant, for example, uses inputs such as pizza dough, pizza sauce, cooks, and ovens to produce pizza. A firm's **technology** is the processes it uses to turn inputs into outputs of goods and services. Notice that this economic definition of technology is broader than the everyday definition. In everyday language, *technology* usually refers only to the development of new products. In the economic sense, a firm's technology depends on many factors, such as the skills of its managers, the training of its workers, and the speed and efficiency of its machinery and equipment. A pizza restaurant's technology of pizza production, for example, includes not only the capacity of its pizza ovens and how quickly they bake the pizza but also how quickly the cooks can prepare the pizza for baking and how well the firm's manager motivates the workers and arranges the kitchens to allow the cooks to quickly prepare the pizzas and get them in the ovens.

Technological change A positive or negative change in the ability of a firm to produce a given level of output with a given quantity of inputs.

A firm can experience positive or negative **technological change**:

1. Whenever a firm experiences *positive technological change*, it is able to produce more output using the same inputs or the same output using fewer inputs. For example, a firm's managers may increase production or sales by rearranging the layout of a retail store or the floor of a factory, by creating a training program for workers, or by installing faster or more reliable machinery or equipment.
2. A firm can also experience *negative technological change*. For example, if a firm hires less-skilled workers or if a hurricane damages its facilities, the quantity of output it can produce from a given quantity of inputs may decline.

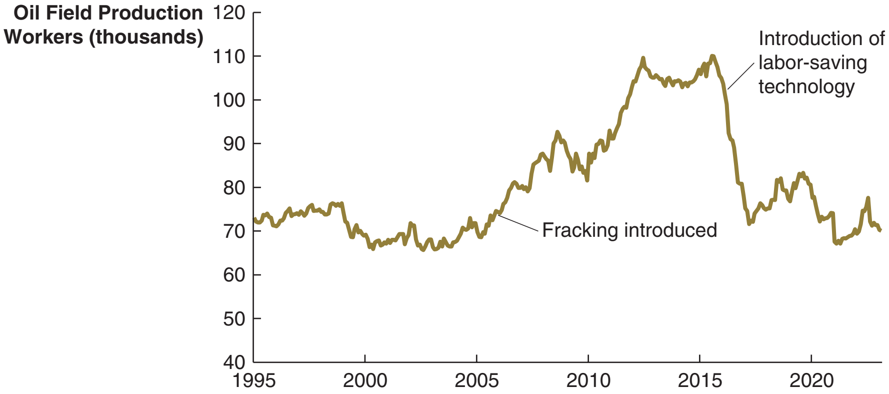
Apply the Concept

Oil Roughnecks Encounter Robots and Drones

In 1998, Nick Steinsberger, an engineer working in Texas for Mitchell Energy, developed a new technology for extracting natural gas from shale rock. The technology, now known as hydraulic fracturing, or *fracking*, involves pumping a mixture of water, sand, and chemicals into shale rock formations that contain oil and natural gas. Before this technology was invented, oil companies could not profitably recover fossil fuels from such rock formations. With years of work, Steinberger's original technique was adapted to extract oil as well as natural gas. By 2008, most firms were using fracking techniques when drilling new oil wells, and today all new oil wells in the United States use fracking.

Fracking is an example of positive technological change and has led to a huge expansion in oil production in the United States. Fracking made it possible to pump oil from shale formations where it hadn't previously been profitable, but it had little effect on the amount of labor required to operate a well. As the following figure shows, employment of production workers (nicknamed "roughnecks") in the oil fields increased rapidly beginning in 2005 as energy firms began using fracking technology to drill more wells. Increasing oil production required firms to increase the number of workers hired.

After reaching a peak in 2012, employment in oil fields remained between 100,000 and 110,000 workers until early 2016, when it began a rapid decline. There were two reasons for the decline: The first was a short-run response to the price of oil declining from almost $98 per barrel in 2013 to $43 per barrel in 2016. In reaction to the fall in price, oil firms reduced production and employment. The second reason for the decline in employment was the result of oil firms starting to introduce labor-saving technologies. In early 2023, oil prices were above $80 per barrel, and U.S. oil production was 30 percent above its 2016 level—but employment in the oil industry was nearly 35 percent *lower* than its 2016 peak. In early 2023, U.S. oil companies were producing about 5,200 barrels of oil per worker per month—nearly double the production of 2,700 barrels per worker per month in 2016.



How could oil companies produce more oil with fewer workers? By 2016, the companies had an incentive to adopt new technologies both because falling prices were making it difficult to earn a profit and because they were paying annual wages of $150,000 to attract experienced oil field workers. Advances in information technology allowed the companies to use sensors linked to computers and smartphones to monitor conditions in wells that can be drilled thousands of feet underground. The new technology allows one worker to remotely monitor multiple wells. Previously, workers would gather data from each well by hand. Other technological advances, such as robots that drill wells and drones that remotely monitor wells, also reduced the number of workers oil firms need to hire. The ability to produce nearly twice as much oil per worker is a dramatic example of technological change raising labor productivity, or the amount of output workers can produce over a given length of time.

But as technological change occurred in the oil fields, roughnecks needed to learn to adapt to using information technology. An article in the *Wall Street Journal* noted, "For decades, high school graduates could jump into a job on a drilling rig with few technical skills and expect a well-paid career." As one industry observer put it: "It used to be you had a toolbox full of wrenches and tubing benders. Now your main tool is a laptop."

Your Turn: Test your understanding by doing related problem 1.3 at the end of this chapter.

11.2 The Short Run and the Long Run in Economics

LEARNING OBJECTIVE: Distinguish between the economic short run and the economic long run.

Short run The period of time during which at least one of a firm's inputs is fixed.

Long run The period of time in which a firm can vary all its inputs, adopt new technology, and increase or decrease the size of its physical plant.

When firms analyze the relationship between their level of production and their costs, they separate the time period involved into the short run and the long run. In the **short run**, at least one of the firm's inputs is fixed. In particular, in the short run, the firm's technology and the size of its physical plant—its factory, store, or office—are both fixed, while some other inputs, including the number of workers the firm hires, are variable. In the **long run**, the firm is able to vary all its inputs, adopt new technology, and increase or decrease the size of its physical plant.

The actual length of calendar time before the short run becomes the long run differs from firm to firm. A pizza restaurant may have a short run of just a few weeks before it is able to increase its physical plant by adding another pizza oven and some tables and chairs. General Motors, in contrast, may have a short run of a year or more before it can increase the capacity of one of its automobile assembly plants by installing new equipment.

The Difference between Fixed Costs and Variable Costs

Total cost The cost of all the inputs a firm uses in production.

Variable costs Costs that change as output changes.

Fixed costs Costs that remain constant as output changes.

Total cost is the cost of all the inputs a firm uses in production. We have just seen that in the short run, some inputs are fixed and others are variable. The costs of the fixed inputs are called *fixed costs*, and the costs of the variable inputs are called *variable costs*. We can also think of **variable costs** as the costs that change as output changes. Similarly, **fixed costs** are costs that remain constant as output changes. A typical firm's variable costs include its labor costs, raw material costs, and costs of electricity and other utilities. Typical fixed costs include lease payments for factory or retail space, payments for fire insurance, and payments for advertising. All of a firm's costs are either fixed or variable, so we can state the following:

$$\text{Total cost} = \text{Fixed cost} + \text{Variable cost}$$

or, using symbols:

$$TC = FC + VC.$$

Apply the Concept

Fixed Costs in the Publishing Industry

In 2022, a former editor at Cambridge University Press gave the following estimates of the annual fixed costs for a medium-size academic book publisher:

Cost	Amount
Salaries and benefits (of publishing employees)	$625,000
Rent	75,000
Utilities	20,000
Supplies	6,000
Postage	5,000
Travel	9,000
Association memberships, subscriptions, and book purchases	5,000
Miscellaneous	5,000
Total	$750,000

Elena Elisseeva/Shutterstock

The wages of this editor are a fixed cost to the publisher.

Academic book publishers hire editors, designers, and production and marketing managers who help prepare books for publication. Because these employees work on several books simultaneously, the number of people the company hires does not go up and down with the quantity of books the company publishes during any particular year. Publishing companies therefore consider the salaries and benefits of people in these job categories to be fixed costs.

In contrast, for a company that *prints* books, the quantity of workers varies with the quantity of books printed. The wages and benefits of the workers operating the offset printing presses, for example, would be a variable cost.

The other costs listed in the table are typical of fixed costs at many firms.

Your Turn: Test your understanding by doing related problems 2.9, 2.10, and 2.11 at the end of this chapter.

Implicit Costs versus Explicit Costs

Remember that economists always measure cost as **opportunity cost**, which is the highest-valued alternative that must be given up to engage in an activity. As we saw in Chapter 8, Section 8.3, costs are either *explicit* or *implicit*. When a firm spends money, it incurs an **explicit cost**. When a firm experiences a nonmonetary opportunity cost, it incurs an **implicit cost**.

Opportunity cost The highest-valued alternative that must be given up to engage in an activity.

Explicit cost A cost that involves spending money.

Implicit cost A nonmonetary opportunity cost.

For example, suppose that Jill Johnson owns a pizza restaurant. Her explicit costs include the wages she pays her workers and the payments she makes for rent and electricity. But some of Jill's most important costs are implicit. Before opening her own restaurant, Jill earned a salary of $30,000 per year managing a restaurant for someone else. To start her restaurant, Jill quit her job, withdrew $50,000 from her bank account—where she was earning interest of $3,000 per year—and used the funds to equip her restaurant with tables, chairs, a cash register, and other equipment. To open her own business, Jill had to give up the $30,000 salary and the $3,000 in interest. This $33,000 is an implicit cost because it does not represent payments that Jill has to make. Nevertheless, giving up this $33,000 per year is a real cost to Jill.

In addition, during the course of the year, the $50,000 worth of tables, chairs, and other physical capital in Jill's store will lose some of its value partly due to wear and tear and partly due to better furniture, cash registers, and so forth becoming available. *Economic depreciation* is the difference between what Jill paid for her capital at the beginning of the year and what she would receive if she sold the capital at the end of the year. If Jill could sell the capital for $40,000 at the end of the year, the $10,000 in economic depreciation would represent another implicit cost. (Note that the whole $50,000 she spent on the capital is not a cost because she still has the equipment at the end of the year, although it is now worth only $40,000.)

Table 11.1 lists Jill's costs. The rules of accounting generally require that only explicit costs be used for purposes of keeping the company's financial records and for paying taxes (see Chapter 8, Section 8.3). Therefore, explicit costs are sometimes called *accounting costs*. *Economic costs* include both accounting costs and implicit costs.

Table 11.1

Jill Johnson's Costs per Year

Jill's Explicit Costs	Amount
Pizza dough, tomato sauce, and other ingredients	$20,000
Wages	48,000
Interest payments on her loan to buy pizza ovens	10,000
Electricity	6,000
Lease payment for her restaurant	24,000
Jill's Implicit Costs	
Forgone salary	30,000
Forgone interest	3,000
Economic depreciation	10,000
Total	**$151,000**

Table 11.2

Short-Run Production and Cost at Jill Johnson's Restaurant

(1) Quantity of Workers	(2) Quantity of Pizza Ovens	(3) Quantity of Pizzas per Week	(4) Cost of Pizza Ovens (fixed cost)	(5) Cost of Workers (variable cost)	(6) Total Cost of Pizzas per Week	(7) Cost per Pizza (average total cost)
0	2	0	$800	$0	$800	—
1	2	200	800	650	1,450	$7.25
2	2	450	800	1,300	2,100	4.67
3	2	550	800	1,950	2,750	5.00
4	2	600	800	2,600	3,400	5.67
5	2	625	800	3,250	4,050	6.48
6	2	640	800	3,900	4,700	7.34

The Production Function

Let's look at the relationship in the short run between Jill Johnson's level of production and her costs. We can simplify the example in Table 11.1 by assuming that Jill employs only labor—workers—and one type of capital—pizza ovens—to produce a single good: pizzas. Many firms use more than two inputs and produce more than one good, but it is easier to understand the relationship between output and cost by focusing on the case of a firm using only two inputs and producing only one good. In the short run, Jill doesn't have time to build a larger restaurant, install additional pizza ovens, or redesign the layout of her restaurant. So, in the short run, she can increase or decrease the quantity of pizzas she produces only by increasing or decreasing the number of workers she employs.

The first three columns of Table 11.2 show the relationship between the quantity of workers and ovens Jill uses per week and the quantity of pizzas she can produce. The relationship between the inputs employed by a firm and the maximum output the firm can produce with those inputs is called the firm's **production function**. Because a firm's technology is the processes it uses to turn inputs into output, the production function represents the firm's technology. The first three columns of Table 11.2 show Jill's *short-run* production function because we are assuming that the time period is too short for Jill to increase or decrease the quantity of ovens she is using.

Production function The relationship between the inputs employed by a firm and the maximum output the firm can produce with those inputs.

A First Look at the Relationship between Production and Cost

The last four columns of Table 11.2 show Jill Johnson's costs. We can determine the total cost of producing a given quantity of pizzas if we know how many workers and ovens are required to produce that quantity and how much Jill has to pay for those workers and ovens. Suppose Jill has taken out a bank loan to buy two pizza ovens. The cost of the loan is $800 per week. Therefore, her fixed costs are $800 per week. If Jill pays $650 per week to each worker, her variable costs depend on how many workers she hires. In the short run, Jill can increase the quantity of pizzas she produces only by hiring more workers. Table 11.2 shows that if she hires 1 worker, she produces 200 pizzas during the week; if she hires 2 workers, she produces 450 pizzas; and so on. For a particular week, Jill's total cost of producing pizzas is equal to the $800 she pays on the loan for the ovens plus the amount she pays to hire workers. If Jill decides to hire 4 workers and produce 600 pizzas, her total cost is $3,400: $800 to lease the ovens and $2,600 to hire the workers. Her cost per pizza is equal to her total cost of producing pizzas divided by the quantity of pizzas produced. If she produces 600 pizzas at a total cost of $3,400, her cost per pizza, or *average total cost*, is $3,400/600 = $5.67. A firm's **average total cost** is always equal to its total cost divided by the quantity of output produced.

Average total cost Total cost divided by the quantity of output produced.

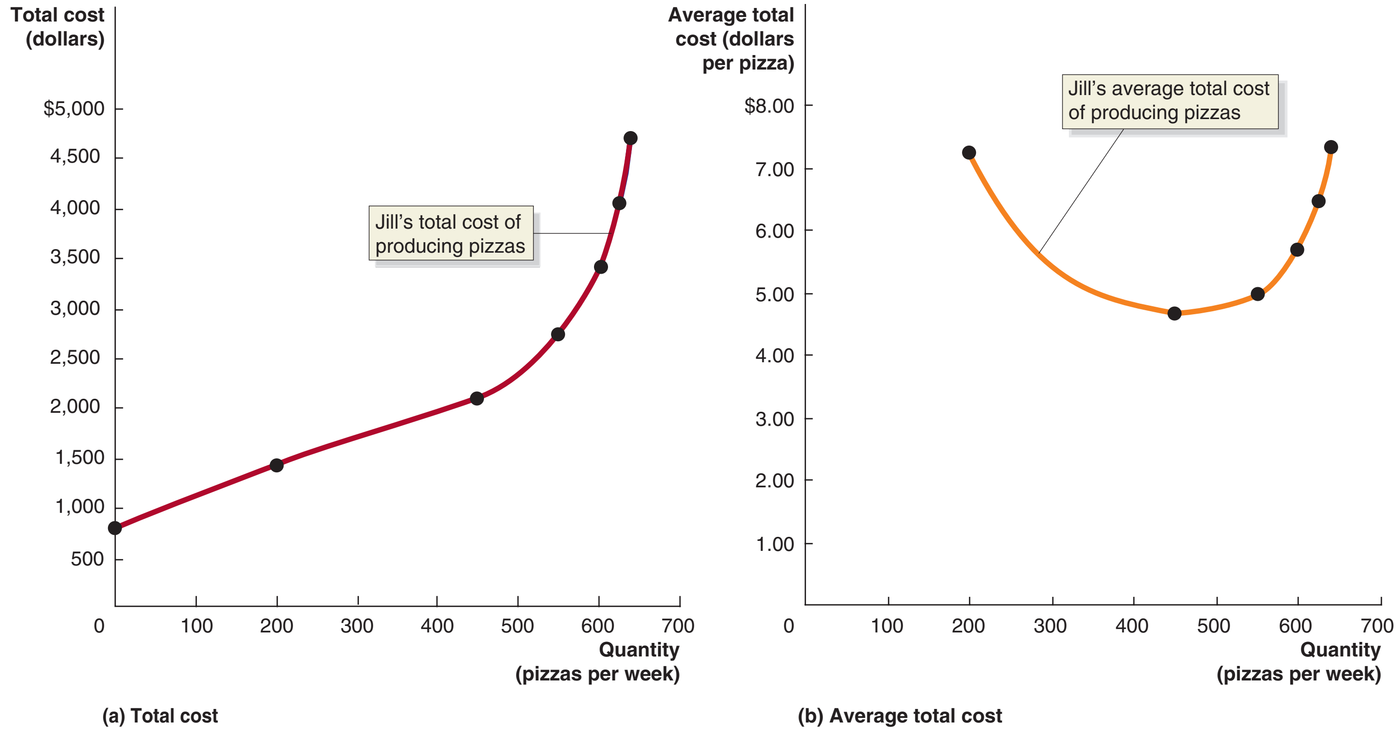


Figure 11.1 **Graphing Total Cost and Average Total Cost at Jill Johnson's Restaurant**

We can use the information from Table 11.2 to graph the relationship between the quantity of pizzas Jill produces and her total cost and average total cost. Panel (a) shows that total cost increases as the level of production increases. Panel (b) shows that her average total cost is roughly U shaped: As production increases from low levels, average total cost falls before rising at higher levels of production.

Panel (a) of Figure 11.1 uses the numbers in column (6) of Table 11.2 to graph Jill's total cost. Panel (b) uses the numbers in column (7) to graph her average total cost. Notice in panel (b) that Jill's average total cost curve has a roughly U shape. As production increases from low levels, average total cost falls. Average total cost then rises at higher levels of production. To understand why the average total cost curve has this U shape, we first need to look more closely at the technology of producing pizzas, as shown by the production function for Jill's restaurant. Then we need to look at how this technology determines the relationship between production and cost.

11.3 The Marginal Product of Labor and the Average Product of Labor

LEARNING OBJECTIVE: Explain and illustrate the relationship between the marginal product of labor and the average product of labor.

To better understand the choices Jill Johnson faces at her pizza restaurant, given the technology available to her, think first about what happens if she hires only one worker. That one worker will have to perform several different activities, including taking orders from customers, baking the pizzas, bringing the pizzas to the customers' tables, and entering sales in the cash register. If Jill hires two workers, some of these activities can be divided up: One worker could take the orders, enter the sales in the register, and bring the pizzas to the customers' tables, and the other worker could prepare and bake the pizzas. With such a division of tasks, Jill will find that hiring two workers actually allows her to produce more than twice as many pizzas as she could produce with just one worker.

Table 11.3

The Marginal Product of Labor at Jill Johnson's Restaurant

Quantity of Workers	Quantity of Pizza Ovens	Quantity of Pizzas	Marginal Product of Labor
0	2	0	—
1	2	200	200
2	2	450	250
3	2	550	100
4	2	600	50
5	2	625	25
6	2	640	15

Marginal product of labor The additional output a firm produces as a result of hiring one more worker.

The additional output a firm produces as a result of hiring one more worker is called the **marginal product of labor**. We can calculate the marginal product of labor by determining how much total output increases as each additional worker is hired, which we do for Jill's restaurant in Table 11.3.

When Jill hires only one worker, she increases output from 0 pizzas to 200 pizzas per week. So, the marginal product of labor for the first worker is 200 pizzas. When she hires two workers, she produces 450 pizzas per week. Hiring the second worker increases her output by 250 pizzas per week. For the second worker, the marginal product of labor rises to 250 pizzas. This increase in marginal product results from the *division of labor* and from *specialization*. By dividing the tasks to be performed—the division of labor—Jill reduces the time workers lose moving from one activity to the next. She also allows them to become more specialized at their tasks. For example, a worker who concentrates on preparing and baking pizzas will become more skilled and require less time to carry out these activities.

The Law of Diminishing Returns

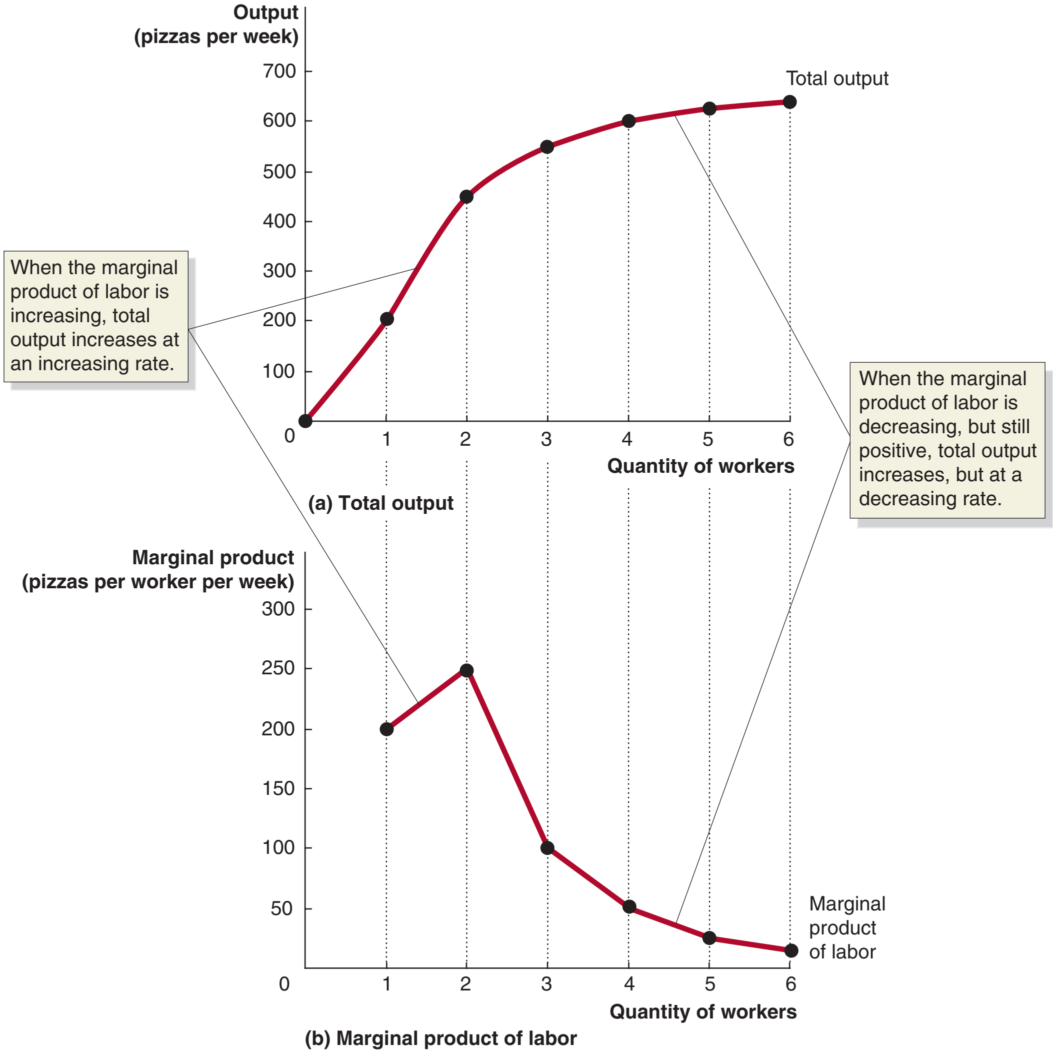
Law of diminishing returns The principle that, at some point, adding more of a variable input, such as labor, to the same amount of a fixed input, such as capital, will cause the marginal product of the variable input to decline.

In the short run, the quantity of pizza ovens Jill leases is fixed, so as she hires more workers, the marginal product of labor eventually begins to decline. At some point, Jill uses up the gains from the division of labor and from specialization and starts to experience the effects of the **law of diminishing returns**. This principle states that adding more of a variable input, such as labor, to the same amount of a fixed input, such as capital, will eventually cause the marginal product of the variable input to decline. For Jill, the marginal product of labor begins to decline when she hires the third worker. Hiring three workers raises the quantity of pizzas she produces from 450 per week to 550. But the increase in the quantity of pizzas—100—is less than the increase when she hired the second worker—250—so the marginal product of labor has declined.

If Jill kept adding more and more workers to the same quantity of pizza ovens, workers would eventually begin to get in each other's way, and the marginal product of labor would actually become negative. When the marginal product is negative, the level of total output declines. No firm would in reality hire so many workers as to experience a negative marginal product of labor and falling total output.

Graphing Production

Panel (a) in Figure 11.2 graphs the relationship between the quantity of workers Jill hires and her total output of pizzas, using the numbers from Table 11.3. Panel (b) graphs the marginal product of labor. In panel (a), output increases as more workers are hired, but the increase in output does not occur at a constant rate. Because of specialization and the division of labor, output at first increases at an increasing rate, with each additional worker hired causing production to increase by a *larger* amount than did the hiring of the previous worker. But after the second worker has been hired, hiring more workers while keeping the quantity of ovens constant results in diminishing returns. When the point of diminishing returns is reached, production increases at a decreasing rate. Each additional worker Jill hires after the second worker causes



When the marginal product of labor is increasing, total output increases at an increasing rate.

When the marginal product of labor is decreasing, but still positive, total output increases, but at a decreasing rate.

(a) Total output

(b) Marginal product of labor

Figure 11.2 **Total Output and the Marginal Product of Labor**

In panel (a), output increases as more workers are hired, but the increase in output does not occur at a constant rate. Because of specialization and the division of labor, output at first increases at an increasing rate, with each additional worker hired causing production to increase by a *greater* amount than did the hiring of the previous worker. When the point of diminishing returns is reached, production increases at a decreasing rate. Each additional worker Jill hires after the second worker causes production to increase by a *smaller* amount than did the hiring of the previous worker. In panel (b), the *marginal product of labor* is the additional output produced as a result of hiring one more worker. The marginal product of labor rises initially because of the effects of specialization and division of labor, and then it falls because of the effects of diminishing returns.

production to increase by a *smaller* amount than did the hiring of the previous worker. In panel (b), the marginal product of labor curve rises initially because of the effects of specialization and the division of labor, and then it falls because of the effects of diminishing returns.

Apply the Concept

Adam Smith's Famous Account of the Division of Labor in a Pin Factory

The Wealth of Nations, written in Scotland by Adam Smith in 1776, is the first book to have presented some of the key ideas of economics. Smith considered the division of labor important enough to discuss in the first chapter of the book. He illustrated the concept

SPUTNIK/Alamy Stock Photo

The gains from division of labor and specialization are as important on this automobile assembly line today as they were in the eighteenth century, when Adam Smith first discussed them.

by using an example of how the manager of a pin factory makes pins by dividing the work into a series of tasks:

> One man draws out the wire, another straightens it, a third cuts it, a fourth points it, a fifth grinds it at the top for receiving the head; to make the head requires two or three distinct operations; to put it on is a . . . [distinct operation], to whiten the pins is another; it is even a trade by itself to put them into the paper; and the important business of making a pin is, in this manner, divided into eighteen distinct operations.

Because the labor of pin making was divided up in this way, an average worker was able to produce about 4,800 pins per day. Smith estimated that a single worker operating by himself each of the machines used in pin making would make only about 20 pins per day. Smith concluded, "The greatest improvement in the productive powers of labor . . . [has] been the effects of the division of labor." Pin manufacturers still exist. WH Bagshaw, located in Nashua, New Hampshire, operates the oldest surviving pin factory in the world. A news article explains that the factory still relies on production methods similar to those described by Adam Smith: "All over the building are reminders of the Industrial Revolution days, where in the lower level, Bagshaw Co. still uses grinder machines that sharpen cable threads into pins against stone."

Two hundred and fifty years later, economists agree with Smith's conclusion about the importance of the division of labor. Understanding the gains from the division of labor and specialization remains relevant to most business situations today.

Your Turn: Test your understanding by doing related problem 3.7 at the end of this chapter.

The Relationship between Marginal Product and Average Product

Average product of labor The total output produced by a firm divided by the quantity of workers.

The marginal product of labor tells us how much total output changes as the quantity of workers hired changes. We can also calculate the **average product of labor**, which is the total output produced by a firm divided by the quantity of workers. For example, using the numbers in Table 11.3, if Jill hires 4 workers to produce 600 pizzas, the average product of labor is $600/4 = 150$.

Note the relationship between the marginal and average products: *The average product of labor is the average of the marginal products of labor*. For example, the numbers from Table 11.3 show that the marginal product of the first worker Jill hires is 200, the marginal product of the second worker is 250, and the marginal product of the third worker is 100. Therefore, the average product of labor for three workers is 183.3:

$$\underbrace{183.3}_{\text{Average product of labor for three workers}} = (\underbrace{200}_{\text{Marginal product of labor of first worker}} + \underbrace{250}_{\text{Marginal product of labor of second worker}} + \underbrace{100}_{\text{Marginal product of labor of third worker}})/3$$

By taking the average of the marginal products of the first three workers, we have the average product of the three workers.

Whenever the marginal product of labor is greater than the average product of labor, the average product of labor must be increasing. This statement is true for the same reason that a person 6 feet, 2 inches tall entering a room where the average height is 5 feet, 9 inches raises the average height of people in the room. Whenever the marginal product of labor is less than the average product of labor, the average product of labor must be decreasing. The marginal product of labor equals the average product of labor at the quantity of workers for which the average product of labor is at its maximum.

An Example of Marginal and Average Values: College Grades

The relationship between the marginal product of labor and the average product of labor is the same as the relationship between the marginal and average values of any variable. To see this point more clearly, think about the familiar relationship between a student's grade point average (GPA) in one semester and his overall, or cumulative, GPA. The table in Figure 11.3 shows Paul's college grades for each semester, beginning with fall of his first year. The graph in Figure 11.3 plots the grades from the table. Just as each additional worker hired adds to a firm's total production, each additional semester adds to Paul's total grade points. We can calculate what hiring each individual worker adds to total production (marginal product), and we can calculate the average production of the workers hired so far (average product).

Similarly, we can calculate the GPA Paul earns in a particular semester (his "marginal GPA"), and we can calculate his cumulative GPA for all the semesters he has completed so far (his "average GPA"). As the table shows, Paul gets off to a weak start in the fall semester of his first year, earning only a 1.50 GPA. In each subsequent semester through the fall of his junior year, his GPA for the semester increases from the previous semester—raising his cumulative GPA. As the graph shows, however, his cumulative GPA does not increase as

Figure 11.3

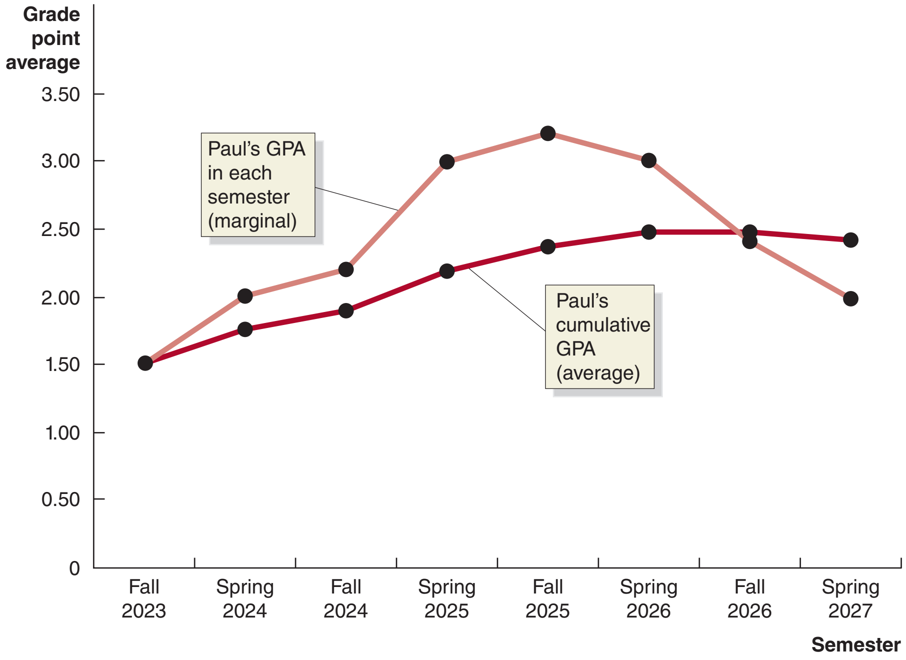
Marginal and Average GPAs

The relationship between marginal and average values for a variable can be illustrated using GPAs. We can calculate the GPA Paul earns in a particular semester (his "marginal GPA"), and we can calculate his cumulative GPA for all the semesters he has completed so far (his "average GPA"). Paul's GPA is only 1.50 in the fall semester of his first year. In each following semester through the fall of his junior year, his GPA for the semester increases—raising his cumulative GPA. In Paul's junior year, even though his semester GPA declines from fall to spring, his cumulative GPA rises. Only in the fall of his senior year, when his semester GPA drops below his cumulative GPA, does his cumulative GPA decline.

	Semester GPA (marginal GPA)	Cumulative GPA (average GPA)
First year		
Fall	1.50	1.50
Spring	2.00	1.75
Sophomore year		
Fall	2.20	1.90
Spring	3.00	2.18
Junior year		
Fall	3.20	2.38
Spring	3.00	2.48
Senior year		
Fall	2.40	2.47
Spring	2.00	2.41

Average GPA continues to rise, although marginal GPA falls.

With the marginal GPA below the average, the average GPA falls.



rapidly as his semester-by-semester GPA because his cumulative GPA is held back by the low GPAs of his first few semesters. Notice that in Paul's junior year, even though his semester GPA declines from fall to spring, his cumulative GPA rises. Only in the fall of his senior year, when his semester GPA drops below his cumulative GPA, does his cumulative GPA decline.

11.4 The Relationship between Short-Run Production and Short-Run Cost

LEARNING OBJECTIVE: Explain and illustrate the relationship between marginal cost and average total cost.

We have seen that technology determines the values of the marginal product of labor and the average product of labor. In turn, the marginal and average products of labor affect the firm's costs. Keep in mind that the relationships we are discussing are *short-run* relationships: We are assuming that the time period is too short for the firm to change its technology or the size of its physical plant.

The average total cost curve in panel (b) of Figure 11.1 for Jill Johnson's restaurant has a U shape. As we will soon see, the U shape of the average total cost curve is determined by the shape of the curve that shows the relationship between *marginal cost* and the level of production.

Marginal Cost

Marginal cost The change in a firm's total cost from producing one more unit of a good or service.

One of the key ideas in economics is that optimal decisions are made at the margin (see Chapter 1, Section 1.1). Consumers, firms, and government officials usually make decisions about doing a little more or a little less. As Jill Johnson considers whether to hire additional workers to produce additional pizzas, she needs to consider how much she will add to her total cost by producing the additional pizzas. **Marginal cost** is the change in a firm's total cost from producing one more unit of a good or service. We can calculate marginal cost for a particular increase in output by dividing the change in total cost by the change in output. We can express this idea mathematically (remember that the Greek letter delta, Δ, means, "change in"):

$$MC = \frac{\Delta TC}{\Delta Q}.$$

In the table in Figure 11.4, we use this equation to calculate Jill's marginal cost of producing pizzas. The values for the other columns in the table are from Table 11.2 and Table 11.3.

Why Are the Marginal and Average Cost Curves U Shaped?

Notice in the graph in Figure 11.4 that Jill's marginal cost of producing pizzas declines at first and then increases, giving the marginal cost curve a U shape. The table in Figure 11.4 also shows the marginal product of labor. This table helps us understand the important relationship between the marginal product of labor and the marginal cost of production:

- The marginal product of labor is *rising* for the first two workers, but the marginal cost of the pizzas produced by these workers is *falling*.
- The marginal product of labor is *falling* for the last four workers, but the marginal cost of pizzas produced by these workers is *rising*.

We can generalize what the table shows us: *When the marginal product of labor is rising, the marginal cost of output is falling. When the marginal product of labor is falling, the marginal cost of output is rising.*

One way to understand the relationship between the marginal product of labor and the marginal cost of output is to notice that the only additional cost to Jill from producing more pizzas is the additional wages she pays to hire more workers. She pays each new worker the same $650 per week. So the marginal cost of the additional pizzas each worker makes depends on that worker's additional output, or marginal product. As long

Quantity of Workers	Quantity of Pizzas	Marginal Product of Labor	Total Cost of Pizzas	Marginal Cost of Pizzas	Average Total Cost of Pizzas
0	0	–	$800	–	–
1	200	200	1,450	$3.25	$7.25
2	450	250	2,100	2.60	4.67
3	550	100	2,750	6.50	5.00
4	600	50	3,400	13.00	5.67
5	625	25	4,050	26.00	6.48
6	640	15	4,700	43.33	7.34

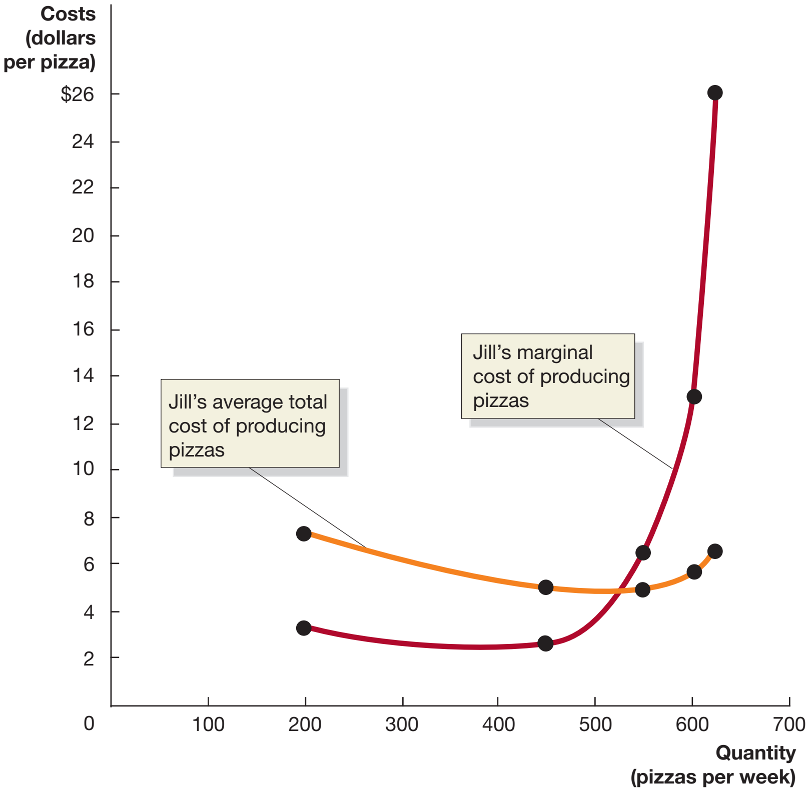


Figure 11.4 **Jill Johnson's Marginal Cost and Average Total Cost of Producing Pizzas**

We can use the information in the table to calculate Jill's marginal cost and average total cost of producing pizzas. For the first two workers hired, the marginal product of labor is increasing, which causes the marginal cost of production to fall. For the last four workers hired, the marginal product of labor is falling, which causes the marginal cost of production to increase. Therefore, the marginal cost curve falls and then rises—that is, it has a U shape—because the marginal product of labor rises and then falls. As long as marginal cost is below average total cost, average total cost will be falling. When marginal cost is above average total cost, average total cost will be rising. The relationship between marginal cost and average total cost explains why the average total cost curve also has a U shape. (To make the graph easier to read, we omit the point representing marginal cost for the quantity of 640 pizzas.)

as the additional output from each new worker is rising, the marginal cost of that output is falling. When the additional output from each new worker is falling, the marginal cost of that output is rising. *We can conclude that the marginal cost of output falls and then rises—forming a U shape—because the marginal product of labor rises and then falls.*

The relationship between marginal cost and average total cost follows the usual relationship between marginal and average values. As long as marginal cost is below average total cost, average total cost falls. When marginal cost is above average total cost, average total cost rises. Marginal cost equals average total cost when average total cost is at its lowest point. Therefore, the average total cost curve has a U shape because the marginal cost curve has a U shape.

Solved Problem 11.4

Calculating Marginal Cost and Average Total Cost

Santiago Delgado owns a copier store. He leases two copy machines for which he pays $12.50 each per day. He cannot increase the number of machines he leases without giving the office machine company 6 weeks' notice. He can hire as many workers as he wants, at a cost of $50 per day per worker. These are the only two inputs he uses to produce copies.

a. Fill in the remaining columns in the table by using the definitions of costs.

b. Draw the average total cost curve and marginal cost curve for Santiago's store. Do these curves have the expected shape? Briefly explain.

Quantity of Workers	Quantity of Copies per Day	Fixed Cost	Variable Cost	Total Cost	Average Total Cost	Marginal Cost
0	0					
1	625					
2	1,450					
3	2,200					
4	2,650					
5	2,910					
6	3,100					

Solving the Problem

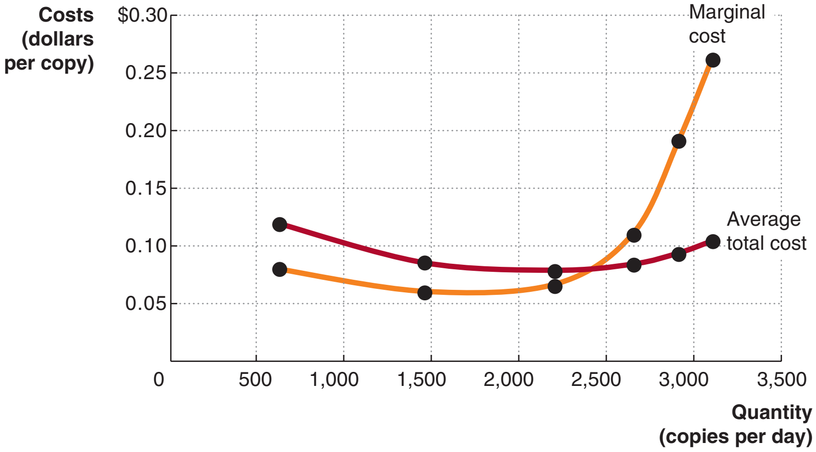
Step 1: Review the chapter material. This problem requires you to understand definitions of costs, so you may want to review the section "The Difference between Fixed Costs and Variable Costs" and the section "Why Are the Marginal and Average Cost Curves U Shaped?"

Step 2: Answer part (a) by using the definitions of costs to fill in the table. Santiago's fixed cost is the amount he pays to lease the copy machines. He uses two copy machines and pays $12.50 per day each to lease them, so his fixed cost is $25 per day. Santiago's variable cost is the amount he pays to hire workers, which is $50 per worker per day. His total cost is the sum of his fixed costs and his variable costs. His average total cost is his total cost divided by the quantity of copies he produces that day. His marginal cost is the change in total cost divided by the change in output. For example, his marginal cost of producing 1,450 copies per day, rather than 625 copies, is:

$$MC = (\$125 - \$75)/(1{,}450 - 625) = \$0.06.$$

Quantity of Workers	Quantity of Copies per Day	Fixed Cost	Variable Cost	Total Cost	Average Total Cost	Marginal Cost
0	0	$25	$0	$25	—	—
1	625	25	50	75	$0.12	$0.08
2	**1,450**	**25**	**100**	**125**	**0.09**	**0.06**
3	2,200	25	150	175	0.08	0.07
4	2,650	25	200	225	0.08	0.11
5	2,910	25	250	275	0.09	0.19
6	3,100	25	300	325	0.10	0.26

Step 3: **Answer part (b) by drawing the average total cost and marginal cost curves for Santiago's store and by explaining whether the curves have the usual shape.** Use the numbers from the table to draw your graph:



We expect average total cost and marginal cost curves to have a U shape, which Santiago's cost curves do. Both cost curves fall and then rise in the same way as the cost curves in Figure 11.4.

Your Turn: For more practice, do related problem 4.9 at the end of this chapter.

11.5 Graphing Cost Curves

LEARNING OBJECTIVE: Graph average total cost, average variable cost, average fixed cost, and marginal cost.

We have seen that we calculate average total cost by dividing total cost by the quantity of output produced. Similarly, we can calculate **average fixed cost** by dividing fixed cost by the quantity of output produced. And we can calculate **average variable cost** by dividing variable cost by the quantity of output produced. We can present these three measures of cost mathematically (with Q representing the level of output) as:

Average fixed cost Fixed cost divided by the quantity of output produced.

Average variable cost Variable cost divided by the quantity of output produced.

$$\text{Average total cost} = ATC = \frac{TC}{Q}$$

$$\text{Average fixed cost} = AFC = \frac{FC}{Q}$$

$$\text{Average variable cost} = AVC = \frac{VC}{Q}.$$

Finally, notice that average total cost is the sum of average fixed cost plus average variable cost:

$$ATC = AFC + AVC.$$

The only fixed cost Jill incurs in operating her restaurant is the $800 per week she pays on the bank loan for her pizza ovens. Her variable costs are the wages she pays her workers. The table and graph in Figure 11.5 show Jill's costs.

We will use graphs like the one in Figure 11.5 in the next several chapters to analyze how firms decide the level of output to produce and the price to charge.

Before going further, be sure you understand the following three key facts about Figure 11.5:

1. The marginal cost (*MC*), average total cost (*ATC*), and average variable cost (*AVC*) curves are all U shaped, and the marginal cost curve intersects both the average variable cost curve and the average total cost curve at their minimum points. When marginal cost is below either average variable cost or average total cost, it causes them to decrease. When marginal cost is above average variable cost or average total cost, it causes them to increase. Therefore, when marginal cost equals average variable cost or average total cost, they must be at their minimum points.
2. As output increases, average fixed cost gets smaller and smaller. In calculating average fixed cost, we are dividing something that gets larger and larger—output—into something that remains constant—fixed cost. Firms often refer to this process of lowering average fixed cost by selling more output as "spreading the overhead" (where "overhead" refers to fixed cost).
3. As output increases, the difference between average total cost and average variable cost decreases. The difference between average total cost and average variable cost is average fixed cost, which gets smaller as output increases.

Figure 11.5

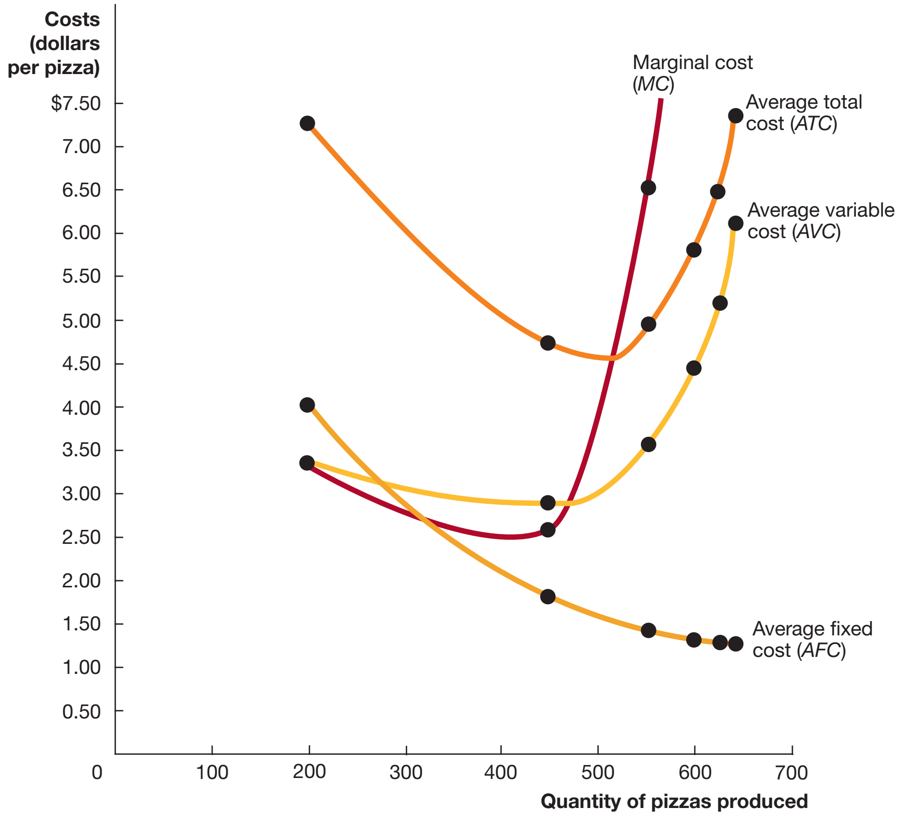
Costs at Jill Johnson's Restaurant

Jill's costs of making pizzas are shown in the table and plotted in the graph. Notice three important facts about the graph:

1. The marginal cost (*MC*), average total cost (*ATC*), and average variable cost (*AVC*) curves are all U shaped, and the marginal cost curve intersects both the average variable cost curve and the average total cost curve at their minimum points.
2. As output increases, average fixed cost (*AFC*) gets smaller and smaller.
3. As output increases, the difference between average total cost and average variable cost decreases.

Make sure you can explain why each of these three facts is true. (To keep the graph easier to read, we plot only the first three values for marginal cost.) You should spend time becoming familiar with this graph because it is one of the most important graphs in microeconomics.

Quantity of Workers	Quantity of Ovens	Quantity of Pizzas	Cost of Ovens (fixed cost)	Cost of Workers (variable cost)	Total Cost of Pizzas	*ATC*	*AFC*	*AVC*	*MC*
0	2	0	$800	$0	$800	–	–	–	–
1	2	200	800	650	1,450	$7.25	$4.00	$3.25	$3.25
2	2	450	800	1,300	2,100	4.67	1.78	2.89	2.60
3	2	550	800	1,950	2,750	5.00	1.45	3.54	6.50
4	2	600	800	2,600	3,400	5.67	1.33	4.33	13.00
5	2	625	800	3,250	4,050	6.48	1.28	5.20	26.00
6	2	640	800	3,900	4,700	7.34	1.25	6.09	43.33



Solved Problem 11.5

The Effect on a Firm's Costs of Using a Generative AI Program

Imani owns a firm that sells payroll services to companies in the Atlanta area. Her largest cost is for labor. She employs workers who use software to prepare payroll reports and to handle texts and calls from client firms. She decides to begin using a *generative AI program*, similar to ChatGPT, which we discussed in the chapter opener. The program will write the additional computer code needed to adapt the payroll software to each individual client's needs and to respond to clients seeking advice on payroll issues. Once the AI program is in place, Imani will need only half as many workers. The number of additional workers she will need to hire for every 20 additional firms that buy her service will fall from 5 to 1. She will have to pay a flat monthly licensing fee for the AI program that will not change with the number of firms she sells her services to. Imani determines that after making these changes, her total cost of providing the service to her 2,000 current clients will fall from $2,000,000 per month to $1,600,000 per month.

In answering the following questions, assume that, apart from the number of workers, none of the other inputs—such as the size of her office, the number of computers, or other software—change as a result of her leasing the AI program.

a. Briefly explain whether each of the following statements about the cost situation at Imani's firm after she begins using the AI program is correct or incorrect.

- **i.** Her firm's average total cost, average variable cost, and average fixed cost curves will shift down, and her firm's marginal cost curve will shift up.
- **ii.** Her firm's average total cost, average variable cost, average fixed cost, and marginal cost curves will all shift up.
- **iii.** Her firm's average total cost, average variable cost, and marginal cost curves will shift down, and her average fixed cost curve will shift up.
- **iv.** Her firm's average total cost, average variable cost, average fixed cost, and marginal cost curves will all shift down.
- **v.** Her firm's average fixed cost curve will shift up, but her other cost curves will be unaffected.

b. Draw a graph illustrating your answer to part (a). Be sure to show the original average total cost, average variable cost, average fixed cost, and marginal cost curves and the shifts—if any—in the curves after Imani begins using the AI program.

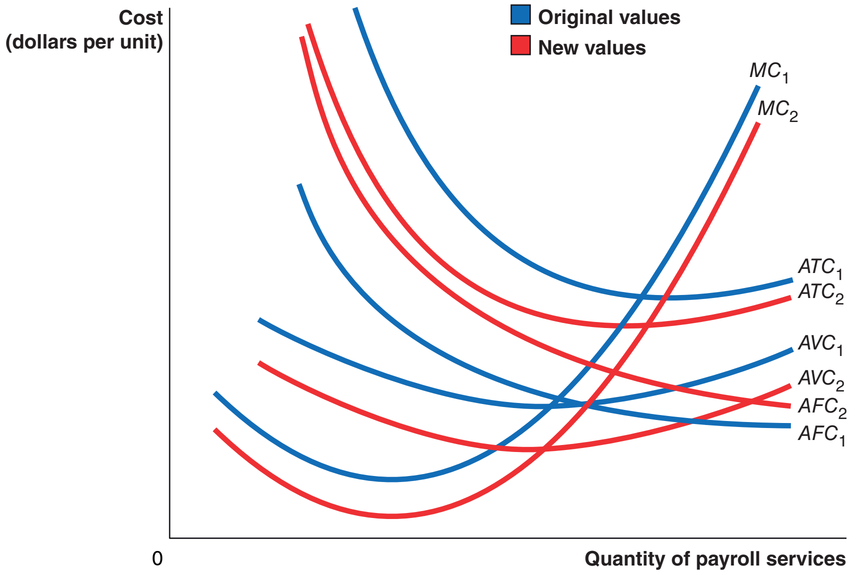
Solving the Problem

Step 1: Review the chapter material. This problem requires you to understand definitions of costs, so you may want to review the sections "The Difference between Fixed Costs and Variable Costs," "Marginal Costs," and "Graphing Cost Curves."

Step 2: Answer part (a) by explaining whether each of the five listed statements is correct or incorrect. The cost of the AI program is fixed because it doesn't change with the quantity of services Imani's company sells. The firm will have a greater fixed cost after licensing the AI program but will have lower variable cost because it will be able to produce the same level of output with fewer workers. The marginal cost will also decline because Imani will need to hire fewer workers as the quantity of services she sells increases. We know that the average total cost per month of providing the service to each of the firm's 2,000 clients will decrease because we are given the information that it will change from $(\$2,000,000/2,000) = \$1,000$ to $(\$1,600,000/2,000) = \$800$.

- **i.** This statement is *incorrect* because her firm's average fixed cost curve will shift up as a result of the total fixed cost increasing by the amount of the AI program license and also because the marginal cost curve will shift down, not up.
- **ii.** This statement is *incorrect* because all of her firm's cost curves, except for the average fixed cost curve, will shift down, not up.
- **iii.** This statement is *correct* because it describes the actual shifts in her firm's cost curves.
- **iv.** This statement is *incorrect* because her firm's average fixed cost curve will shift up, not down.
- **v.** This statement is *incorrect* because rather than being unaffected, her firm's average total cost, average variable cost, and marginal cost curves will shift down.

Step 3: Answer part (b) by drawing the cost curves for Imani's firm before and after she begins using the AI program. Your graph should look like the following, where the curves representing the firm's costs before Imani begins leasing the AI program are in blue and the costs after leasing the program are in red.



Your Turn: For more practice, do related problems 5.9 and 5.10 at the end of this chapter.

11.6 Costs in the Long Run

LEARNING OBJECTIVE: Explain how firms use the long-run average cost curve in their planning.

The distinction between fixed cost and variable cost applies to the short run but *not* to the long run. For example, in the short run, Jill Johnson has a fixed cost of $800 per week because she signed a loan agreement with a bank when she bought her pizza ovens. But in the long run, the cost of buying more pizza ovens becomes variable because Jill can choose whether to expand her business by buying more of them. The same would be true of any other fixed cost a company like Jill's might have. Once a company has purchased a fire insurance policy, the cost of the policy is fixed. But when the policy expires, the company must decide whether to renew it, and the cost becomes variable. The important point is that *in the long run, all costs are variable; there are no fixed costs in the long run*. In other words, in the long run, total cost equals variable cost, and average total cost equals average variable cost.

Managers of successful firms simultaneously consider how they can most profitably run their current store, factory, or office and also whether in the long run they would be more profitable if they became larger or smaller. Jill must consider how to run her current restaurant, which has only two pizza ovens, and she must also plan what to do when her current bank loan is paid off and the lease on her store ends. Should she buy more pizza ovens? Should she lease a larger restaurant?

Long-run average cost curve A curve that shows the lowest cost at which a firm is able to produce a given quantity of output in the long run, when no inputs are fixed.

Economies of scale The situation in which a firm's long-run average cost falls as it increases the quantity of output it produces.

Economies of Scale

Short-run average cost curves represent the costs a firm faces when some input, such as the quantity of machines it uses, is fixed. The **long-run average cost curve** shows the lowest cost at which a firm is able to produce a given quantity of output in the long run, when no inputs are fixed. A firm may experience **economies of scale**, which means the firm's long-run average cost falls as it increases the quantity of output it produces. We can see the effects of economies of scale in Figure 11.6, which shows the relationship

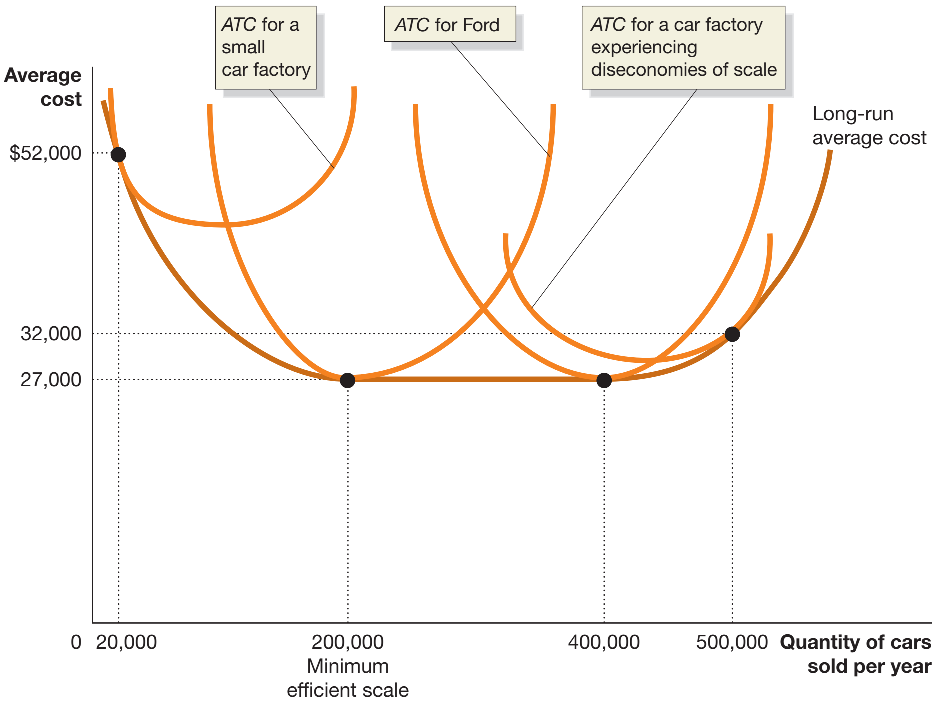


Figure 11.6

The Relationship between Short-Run Average Cost and Long-Run Average Cost

If a small car company expects to sell only 20,000 cars per year, it will be able to produce cars at the lowest average cost of $52,000 per car if it builds the small factory represented by the *ATC* curve on the left of the figure. A larger factory, such as one operated by Ford, will be able to produce 200,000 cars per year at a lower cost of $27,000 per car. An automobile factory producing 200,000 cars per year and a factory producing 400,000 cars per year will experience constant returns to scale and will have the same average cost. An automobile factory assembling 200,000 cars per year will have reached minimum efficient scale. Very large automobile factories will experience diseconomies of scale, and their average costs will rise as production increases beyond 400,000 cars per year.

between short-run and long-run average cost curves. Managers can use long-run average cost curves for planning because they show the effect on cost of expanding output by, for example, building a larger factory or restaurant.

Long-Run Average Cost Curves for Automobile Factories

Figure 11.6 shows long-run average cost in the automobile industry. If a small company expects to sell only 20,000 cars per year, then it will be able to assemble cars at the lowest average cost of $52,000 per car if it builds a small factory, as represented by the *ATC* curve on the left of the figure. A much larger factory, such as those operated by Ford, General Motors, and Toyota, will be able to produce 200,000 cars per year at a lower average cost of $27,000 per car. This decline in average cost from $52,000 to $27,000 represents the economies of scale that exist in manufacturing automobiles. Why would the larger automobile factory have lower average costs? One important reason is that a company like Ford produces 10 times as many cars per year in one of its factories as Lucid Motors produces in its Casa Grande, Arizona factory, but it might need only 6 times as many workers. This saving in labor cost would reduce Ford's average cost of selling cars.

In general, firms may experience economies of scale for a number of reasons, with these being the most important:

1. As in the case of automobile production, the firm's technology may make it possible to increase production with a smaller proportional increase in at least one input.
2. Both workers and managers can become more specialized, enabling them to become more productive, as output expands.
3. Large firms, like Ford, Walmart, or Apple, may be able to purchase inputs at lower costs than smaller competitors. In fact, as Apple and Walmart expanded, their bargaining power with their suppliers increased, and their average costs fell.
4. As a firm expands, it may be able to borrow money at a lower interest rate, thereby lowering its costs.

Economies of scale do not continue indefinitely as the firm increases its output. The long-run average cost curve in most industries has a flat segment that often stretches over a substantial range of output. As Figure 11.6 shows, an automobile factory producing 200,000 cars per year and a factory producing 400,000 cars per year have the same average cost. Over this range of output, firms in the industry experience **constant returns to scale**. As these firms increase their output, they increase their inputs, such as the size of the factory and the quantity of workers, proportionally. The level of output at which all economies of scale are exhausted is known as **minimum efficient scale**. An automobile factory producing 200,000 cars per year has reached minimum efficient scale. Firms that produce at less than minimum efficient scale may have difficulty surviving because they will be producing output at a higher cost than competitors.

Constant returns to scale The situation in which a firm's long-run average costs remain unchanged as it increases output.

Minimum efficient scale The level of output at which all economies of scale are exhausted.

Very large automobile factories experience increasing average costs as managers begin to have difficulty coordinating the operation of the factory. Figure 11.6 shows that for production above 400,000 cars per year, firms in the industry experience **diseconomies of scale**. For instance, Toyota found that as it expanded production at its Georgetown, Kentucky, plant and its plants in China, its managers had difficulty keeping average cost from rising. According to the president of Toyota's Georgetown plant, "Demand for . . . high volumes saps your energy. Over a period of time, it eroded our focus . . . [and] thinned out the expertise and knowledge we painstakingly built up over the years." One analysis of the problems Toyota faced in expanding production concluded, "It is the kind of paradox many highly successful companies face: Getting bigger doesn't always mean getting better."

Diseconomies of scale The situation in which a firm's long-run average cost rises as the firm increases output.

Over time, most firms in an industry will build factories or stores that are at least as large as the minimum efficient scale but not so large that diseconomies of scale occur. For example, in the automobile industry, most factories produce between 200,000 and 400,000 cars per year. However, firms often do not know the exact shape of their long-run average cost curves. As a result, they may mistakenly build factories or stores that are either too large or too small.

Solved Problem 11.6

Using Long-Run Average Cost Curves to Understand a Business Decision

As we saw in the chapter opener, generative AI programs like OpenAI's ChatGPT have the potential to lower costs in many industries by being substitutes for employees currently doing routine work, such as simple computer coding, writing advertisements, or conducting basic background research. We also saw that Microsoft has invested billions in OpenAI. An article in the *Wall Street Journal* discussing the relationship between OpenAI and Microsoft observed that OpenAI "has leapt into the arms of Microsoft, which has made successive rounds of investment, in part because of the need to pay for the computing power needed to make its systems work." An article on bloomberg.com made a similar point that OpenAI "needs Microsoft's funding and cloud-computing power to crunch massive volumes of data and run the increasingly complex models that allow . . . ChatGPT to create astonishingly human-like conversational text."

a. Is OpenAI likely to experience significant economies of scale in producing chatbot services? Briefly explain.

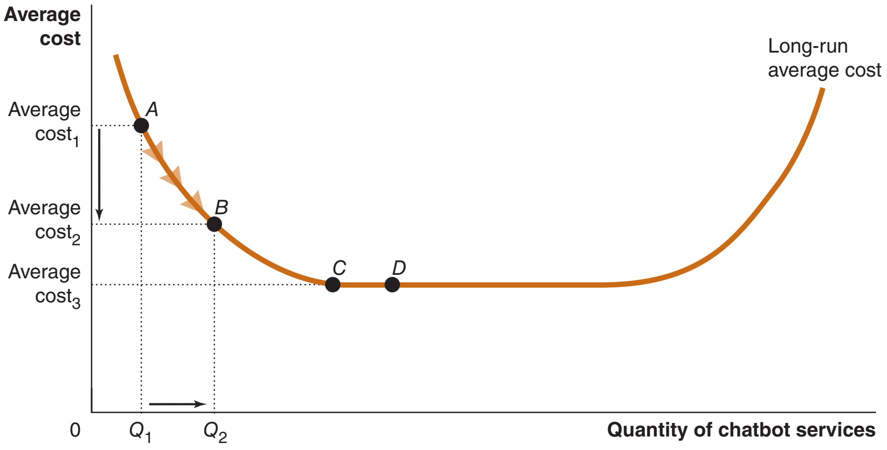
b. Use a long-run average cost curve for OpenAI's production of chatbot services to illustrate the gains the firm hopes to achieve as a result of Microsoft's investments.

Solving the Problem

Step 1: Review the chapter material. This problem is about the long-run average cost curve, so you may want to review the material in the section "Costs in the Long Run."

Step 2: Answer part (a) by explaining whether OpenAI is likely to experience significant economies of scale in producing chatbot services. The largest cost to OpenAI in developing ChatGPT is the work of programmers in writing and improving the program's code. The larger the quantity of chatbot services OpenAI sells, the larger the quantity over which OpenAI can spread that cost. In other words, the average cost of producing chatbot services will decrease as the quantity increases. Therefore, it is likely that there are significant economies of scale in producing chatbot services.

Step 3: Answer part (b) by drawing a long-run average cost graph to illustrate the gains OpenAI hopes to achieve as a result of Microsoft's investment. OpenAI hopes to use the billions of dollars Microsoft is investing to increase the volume of chatbot services the firm can produce. The gain to OpenAI is the lower average cost of producing the services that will result from economies of scale. We assume that OpenAI begins producing at point *A* on its long-run average cost curve, where its output equals Q_1 per month and average cost equals Average cost$_1$. Using the funds Microsoft is investing, OpenAI can pay for enough computing power to expand its output of chatbot services to Q_2, which reduces its average cost to Average cost$_2$.



As drawn, the graph shows that at point *B*, OpenAI is still below minimum efficient scale. It is possible that the investment from Microsoft will provide OpenAI with sufficient funds to push production of chatbot services to minimum efficient scale at point *C* or beyond minimum efficient scale at point *D*. In both cases, OpenAI will have reduced its average cost to Average cost$_3$. All we can say with certainty is that OpenAI expected its average cost to fall as it moved down its long-run average cost curve.

Your Turn: For more practice, do related problem 6.9 at the end of this chapter.

Apply the Concept

The Colossal River Rouge Plant: Diseconomies of Scale at Ford Motor Company

When Henry Ford started the Ford Motor Company in 1903, automobile companies produced cars in small workshops, using highly skilled workers. Ford introduced two new ideas to the automobile industry that allowed him to take advantage of economies of scale. First, Ford used identical—or, interchangeable—parts so that unskilled workers could assemble the cars. Second, instead of having groups of workers moving from one stationary automobile to the next, he had the workers remain stationary and the automobiles move along an assembly line. Ford built a large factory at Highland Park, outside Detroit, where he used these ideas to produce the famous Model T at an average cost well below what his competitors could match using older production methods in smaller factories.

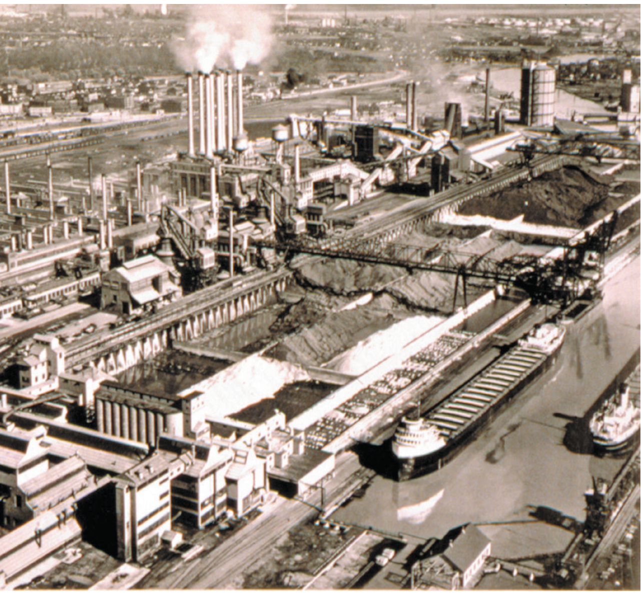
Ford believed that he could produce automobiles at an even lower average cost by building a still larger plant along the River Rouge in Dearborn, Michigan. Unfortunately, Ford's River Rouge plant was too large and suffered from diseconomies of scale. Ford's managers had great difficulty coordinating the production of automobiles in such a large plant. The following description of the River Rouge plant comes from a biography of Ford by Allan Nevins and Frank Ernest Hill:

> A total of 93 separate structures stood on the [River Rouge] site. . . . Railroad trackage covered 93 miles, conveyors 27 [miles]. About 75,000 men worked in the great plant. A force of 5000 did nothing but keep it clean, wearing out 5000 mops and 3000 brooms a month, and using 86 tons of soap on the floors, walls, and 330 acres of windows. The Rouge was an industrial city, immense, concentrated, packed with power. . . . By its very massiveness and complexity, it denied men at the top contact with and understanding of those beneath, and gave those beneath a sense of being lost in inexorable immensity and power.

The *coordination problems* Ford experienced at the River Rouge plant were a key reason for the diseconomies of scale.

Beginning in 1927, Ford produced the Model A—its only car model at that time—at the River Rouge plant. Ford failed to achieve economies of scale and actually *lost money* on each of the four Model A body styles.

Ford could not raise the price of the Model A to make it profitable because at a higher price, the car could not compete with similar models produced by competitors such as General Motors and Chrysler. Ford eventually reduced the cost of making the Model A by constructing smaller factories spread out across the country. These smaller factories assembled the Model A at a lower average cost than was possible at the River Rouge plant.



CSU Archives/Everett Collection Inc/
Alamy Stock Photo

Was Ford's River Rouge plant in Dearborn, Michigan, too big?

Your Turn: Test your understanding by doing related problem 6.10 at the end of this chapter.

Don't Let This Happen to You

Don't Confuse Diminishing Returns with Diseconomies of Scale

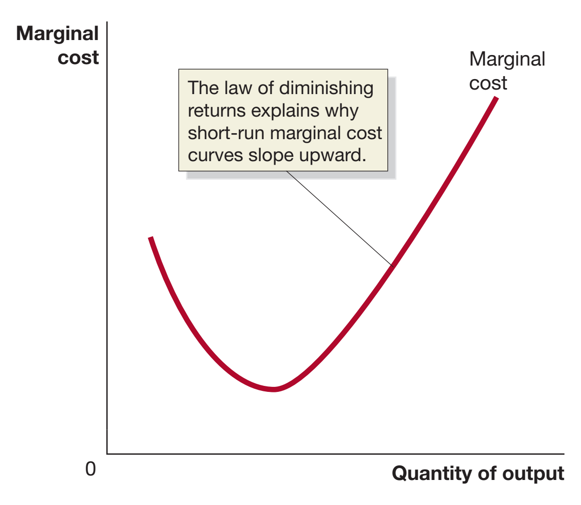
The law of diminishing returns (as illustrated by the graph below):

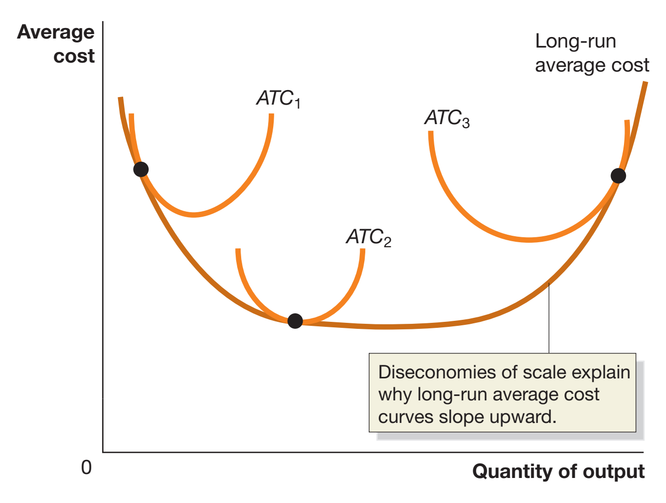
- Applies only to the short run, when at least one of the firm's inputs, such as the quantity of machinery it uses, is fixed.
- Tells us that in the short run, hiring more workers will, at some point, result in less additional output.
- Explains why marginal cost curves eventually slope upward.

Diseconomies of scale (as illustrated by the graph below):

- Apply only in the long run, when the firm can vary all its inputs, can adopt new technology, and can vary the amount of machinery it uses and the size of its facility.
- Explain why long-run average cost curves eventually slope upward.

Your Turn: Test your understanding by doing related problems 6.12 and 6.13 at the end of this chapter.





Continued from chapter opener

Economics in Your Life & Career

Using Cost Concepts in Your Online Business

At the beginning of the chapter, we asked you to suppose that you are about to start a website to sell iPhone cases. Both you and your friend José can buy cases from the manufacturer for $10 each. But because José sells more cases per month than you expect to be able to sell, his costs per case are lower than yours. We asked you to think about why this might be true.

In this chapter, we have seen that firms often experience declining average costs as the quantity they sell increases. A key reason José's average costs might be lower than yours has to do with fixed costs. Because you will have the same computers and software and you rent an office similar to José's, you may be paying about the same amount for equipment and an office lease. You may also be paying about the same amounts for utilities, insurance, and advertising. All these are fixed costs because they do not change as the quantity of cases you sell changes. Because José's fixed costs are the same as yours but he is selling more cases, his average fixed costs are lower than yours, and, therefore, so are his average total costs. With lower average total costs, he can earn a greater profit on each case even though he charges the same price that you charge.

Conclusion

In this chapter, we discussed the relationship between a firm's technology, production, and costs. We encountered a number of definitions of costs. Because we will use these definitions in later chapters, it is useful to bring them together in Table 11.4 for you to review.

We have seen the important relationship between a firm's level of production and its costs. This information is vital to all firms as they attempt to determine the optimal level of production and the optimal prices to charge for their products. We will explore this point further in the next chapter.

Table 11.4

A Summary of Definitions of Cost

Term	Definition	Symbols and Equations
Total cost	Cost of all inputs used by a firm, or fixed costs plus variable costs	TC
Fixed costs	Costs that remain constant as a firm's level of output changes	FC
Variable costs	Costs that change as a firm's level of output changes	VC
Marginal cost	An increase in total cost resulting from producing another unit of output	$MC = \frac{\Delta TC}{\Delta Q}$
Average total cost	Total cost divided by the quantity of output produced	$ATC = \frac{TC}{Q}$
Average fixed cost	Fixed cost divided by the quantity of output produced	$AFC = \frac{FC}{Q}$
Average variable cost	Variable cost divided by the quantity of output produced	$AVC = \frac{VC}{Q}$
Implicit cost	A nonmonetary opportunity cost	—
Explicit cost	A cost that involves spending money	—

CHAPTER SUMMARY AND PROBLEMS

Key Terms

Average fixed cost, p. 399
Average product of labor, p. 394
Average total cost, p. 390
Average variable cost, p. 399
Constant returns to scale, p. 404
Diseconomies of scale, p. 404
Economies of scale, p. 402
Explicit cost, p. 389
Fixed costs, p. 388
Implicit cost, p. 389
Law of diminishing returns, p. 392
Long run, p. 388
Long-run average cost curve, p. 402
Marginal cost, p. 396
Marginal product of labor, p. 392
Minimum efficient scale, p. 404
Opportunity cost, p. 389
Production function, p. 390
Short run, p. 388
Technological change, p. 386
Technology, p. 386
Total cost, p. 388
Variable costs, p. 388

11.1 Technology: An Economic Definition

LEARNING OBJECTIVE: Define technology and give examples of technological change.

Summary

The basic activity of a firm is to use inputs, such as workers, machines, and natural resources, to produce goods and services. The firm's **technology** is the processes it uses to turn inputs into goods and services. **Technological change** refers to a positive or negative change in the ability of a firm to produce a given level of output with a given quantity of inputs.

Review Questions

1.1 What is the difference between technology and technological change?

1.2 Is it possible for technological change to be negative? If so, give an example.

Problems and Applications

1.3 **[Related to the Apply the Concept "Oil Roughnecks Encounter Robots and Drones"]** EOG, a Texas-based producer of oil and gas, is called the "Apple of oil" because of the company's history of developing innovative methods to extract energy from shale rock. Using one of EOG's innovations, called iSteer, the company can navigate through thousands of feet of rock with a drill bit that allows for greater recovery of oil and gas than methods the company previously used. Briefly explain why economists would consider EOG's use of iSteer an example of technological change.

1.4 Which of the following are examples of firms experiencing positive technological change?
- **a.** A fall in the wages JetBlue pays its mechanics leads it to lower its ticket prices.
- **b.** A training program makes a firm's workers more productive.
- **c.** An exercise program makes a firm's workers healthier and reduces the number of days the typical worker is absent.
- **d.** A firm cuts its workforce and is able to maintain its initial level of output.
- **e.** A firm rearranges the layout of its factory and finds that by using its initial set of inputs, it can produce exactly as much as before.

1.5 An article in the *Wall Street Journal* described changes that Starbucks intends to make in its stores: (1) installing new equipment, such as "espresso machines that can pull three shots for complex orders, rather than two;" and (2) redesigning the layout of stores to "bring the equipment [such as refrigerators, ovens, and blenders] closer together." Are either, both, or neither of these changes examples of technological change at Starbucks? Briefly explain.

1.6 Segment.com, based in San Francisco, develops and sells software that allows companies to gather data on customers and manage the companies' social media presence. Segment reorganized its office as part of its "anti-distraction campaign." According to an article in the *Wall Street Journal*, the company cut back on its internal text messaging service and moved "some of its communication back to email to reduce the number of notifications employees were receiving."
- **a.** Is it possible that this movement from a new technology—text messaging—to an older technology—e-mail—represented positive technological change at Segment? Briefly explain.
- **b.** Suppose that competition for software engineers results in Segment.com having to pay them higher salaries. Would the fact that the firm will now face an increased cost of providing its services be an example of negative technological change? Briefly explain.

1.7 According to an article in the *Wall Street Journal*, "United [Airlines] rolled out a new app to its flight attendants earlier this year with so much information about people, the airline has been reluctant to turn on all the functionality. The tool can show flight attendants information on each frequent flier's five previous flights. . . . But United is worried some customers might consider that stalking." Is the app an example of positive technological change? Negative technological change? Does the answer depend on how customers react to United's use of the app? Briefly explain.

11.2 The Short Run and the Long Run in Economics

LEARNING OBJECTIVE: Distinguish between the economic short run and the economic long run.

Summary

In the **short run**, a firm's technology and the size of its factory, store, or office are fixed. In the **long run**, a firm is able to adopt new technology and increase or decrease the size of its physical plant. **Total cost** is the cost of all the inputs a firm uses in production. **Variable costs** are costs that change as output changes. **Fixed costs** are costs that remain constant as output changes. **Opportunity cost** is the highest-valued alternative that must be given up to engage in an activity. An **explicit cost** is a cost that involves spending money. An **implicit cost** is a nonmonetary opportunity cost. The relationship between the inputs employed by a firm and the maximum output it can produce with those inputs is called the firm's **production function**. **Average total cost** is total cost divided by the quantity of output produced.

Review Questions

2.1 What is the difference between the short run and the long run? Is the amount of time that separates the short run from the long run the same for every firm?

2.2 Distinguish between a firm's fixed costs and variable costs and give an example of each.

2.3 What are implicit costs? How are they different from explicit costs?

2.4 What is the production function? What does the short-run production function hold constant?

Problems and Applications

2.5 In the fall of 2022, Amazon announced that it planned "to hire 150,000 people to meet demand during the holiday season."

- **a.** When Amazon hired 150,000 new workers prior to the 2022 holiday season, was that a short-run decision or a long-run decision? Briefly explain.
- **b.** Briefly explain why Amazon didn't invest in new physical capital—such as warehouses and delivery vehicles—to meet consumer demand prior to the 2022 holiday season.

2.6 According to an article in the *Wall Street Journal*, FedEx planned "to raise shipping rates by an average of 6.9% across most of its services" in 2023. Suppose that you own a firm that uses FedEx to ship goods to customers. Are FedEx's shipping charges a fixed cost or a variable cost to you? Briefly explain.

2.7 An article in the *Wall Street Journal* reported that "Macy's Inc. is accelerating its rollout of smaller department stores, betting that it can attract more shoppers with fewer products and more digital services at stores closer to where customers run their daily errands." Is the article about a strategy in the economic short run or in the economic long run? Briefly explain.

2.8 A technology website estimated that the cost of materials and components in Apple's iPhone 14 Pro Max was $464. Apple was selling this phone for $1,099. Can we conclude from this information that Apple was making a profit of about $635?

2.9 **[Related to the Apply the Concept "Fixed Costs in the Publishing Industry"]** A book providing advice to entrepreneurs describes some business costs as being "the amount of money that will go out even if none at all comes in."

- **a.** Is the author describing a business's fixed cost or its variable cost? Briefly explain.
- **b.** Give an example of this type of cost.

2.10 **[Related to the Apply the Concept "Fixed Costs in the Publishing Industry"]** For Jill Johnson's pizza restaurant, explain whether each of the following is a fixed cost or a variable cost.

- **a.** The payment she makes on her fire insurance policy
- **b.** The payment she makes to buy pizza dough
- **c.** The wages she pays her workers
- **d.** The lease payment she makes to the landlord who owns the building where her store is located
- **e.** The $300-per-month payment she makes to her local newspaper for running her weekly advertisements

2.11 **[Related to the Apply the Concept "Fixed Costs in the Publishing Industry"]** A Federal Reserve publication notes that "airlines have high fixed costs." What are likely to be the most important fixed costs for an airline? Are airlines likely to have particularly high fixed costs relative to their variable costs compared with, say, an Old Navy clothing store or a Panera Bread restaurant? Briefly explain.

2.12 Suppose that Bill owns an automobile collision repair shop. The following table shows how the quantity of cars Bill can repair per month depends on the number of workers he hires. Assume that he pays each worker $4,000 per month and his fixed cost is $6,000 per month. Using the information provided, fill in the missing values in the following table.

Quantity of Workers	Quantity of Cars per Month	Fixed Cost	Variable Cost	Total Cost	Average Total Cost
0	0	$6,000			—
1	20				
2	30				
3	40				
4	50				
5	55				

2.13 Suppose Jill Johnson operates her pizza restaurant in a building she owns in the center of the city. Similar buildings in the neighborhood rent for $4,000 per month. Jill is considering selling her building and renting space in the suburbs for $3,000 per month, but she decides not to make the move. She reasons: "I would like to have a restaurant in the suburbs, but I pay no rent for my restaurant now, and I don't want to see my costs rise by $3,000 per month." Evaluate Jill's reasoning.

2.14 When the DuPont chemical company first attempted to enter the paint business, it was not successful. According to a company report, in one year it "lost nearly $500,000 in actual cash in addition to an expected return on investment of nearly $500,000, which made a total loss of income to the company of nearly a million." Why did this report include as part of the company's loss the amount it had expected to earn—but didn't—on its investment in manufacturing paint?

11.3 The Marginal Product of Labor and the Average Product of Labor

LEARNING OBJECTIVE: Explain and illustrate the relationship between the marginal product of labor and the average product of labor.

Summary

The **marginal product of labor** is the additional output produced by a firm as a result of hiring one more worker. Specialization and division of labor cause the marginal product of labor to rise for the first few workers hired. Eventually, the **law of diminishing returns** causes the marginal product of labor to decline. The **average product of labor** is the total amount of output produced by a firm divided by the quantity of workers hired. When the marginal product of labor is greater than the average product of labor, the average product of labor increases. When the marginal product of labor is less than the average product of labor, the average product of labor decreases.

Review Questions

3.1 Draw a graph that shows the usual relationship between the marginal product of labor and the average product of labor. Why do the marginal product of labor and the average product of labor curves have the shapes you drew?

3.2 What is the law of diminishing returns? Does it apply in the long run?

Problems and Applications

3.3 Restaurant owner Devra Gartenstein made the following observation about preparing food: "Cooks become increasingly less productive as a kitchen becomes increasingly crowded."

a. What do economists call the problem she is describing? What are its implications for the marginal product of labor for cooks?

b. Do restaurant owners have a solution to this problem in the long run? Briefly explain.

3.4 Fill in the missing values in the following table.

Quantity of Workers	Total Output	Marginal Product of Labor	Average Product of Labor
0	0		
1	400		
2	900		
3	1,500		
4	1,900		
5	2,200		
6	2,400		
7	2,300		

3.5 Use the numbers from problem 3.4 to draw one graph that shows how total output increases with the quantity of workers hired and a second graph that shows the marginal product of labor and the average product of labor.

3.6 A student looks at the numbers in Table 11.3 and draws this conclusion:

> The marginal product of labor is increasing for the first two workers hired, and then it declines for the next four workers. I guess each of the first two workers must have been hard workers. Then Jill must have had to settle for increasingly bad workers.

Do you agree with the student's analysis? Briefly explain.

3.7 [Related to the Apply the Concept "Adam Smith's Famous Account of the Division of Labor in a Pin Factory"] Briefly explain whether you agree with the following argument:

> Adam Smith's idea of the gains to firms from the division of labor makes a lot of sense when the good being manufactured is something complex like automobiles or computers, but it doesn't apply in the manufacturing of less complex goods or in other sectors of the economy, such as retail sales.

3.8 Sally looks at her college transcript and asks you, "How is this possible? My grade point average for this semester's courses is higher than my grade point average for last semester's courses, but my cumulative grade point average still went down from last semester to this semester." Explain to Sally how this outcome is possible.

3.9 The table below shows the quantity of workers and total output for a local pizza restaurant. Answer the following questions based on the table.

Quantity of Workers	Total Output
0	0
1	5
2	—
3	19
4	24
5	28
6	26

a. When the owner hires 4 workers, what is the average product of labor?

b. What is the marginal product of the fifth worker?

c. If the marginal product of the second worker is 6, what is the total number of pizzas produced when 2 workers are hired?

d. Assuming that the marginal product of the second worker is 6, with which worker hired does the law of diminishing returns set in?

11.4 The Relationship between Short-Run Production and Short-Run Cost

LEARNING OBJECTIVE: Explain and illustrate the relationship between marginal cost and average total cost.

Summary

The **marginal cost** of production is the increase in total cost that results from producing another unit of output. The marginal cost curve has a U shape because when the marginal product of labor is rising, the marginal cost of output is falling, and when the marginal product of labor is falling, the marginal cost of output is rising. When marginal cost is less than average total cost, average total cost falls. When marginal cost is greater than average total cost, average total cost rises. Therefore, the average total cost curve also has a U shape.

Review Questions

4.1 What is the difference between the average total cost of production and the marginal cost of production?

4.2 If the marginal product of labor is rising, is the marginal cost of production rising or falling? Briefly explain.

4.3 Explain why the marginal cost curve intersects the average total cost curve at the level of output where average total cost is at a minimum.

Problems and Applications

4.4 Older oil wells that produce fewer than 10 barrels of oil a day are called "stripper" wells. Suppose that you and a partner own a stripper well that can produce 8 barrels of oil per day, and you estimate that the marginal cost of producing another barrel of oil is $80. In making your calculation, you take into account the cost of labor, materials, and other inputs that increase when you produce more oil. Your partner looks over your calculation of marginal cost and says: "You forgot about that bank loan we received two years ago. If we take into account the amount we pay on that loan, it adds $10 per barrel to our marginal cost of production." Briefly explain whether you agree with your partner's analysis.

4.5 According to an article in the *Wall Street Journal*, Chesapeake Energy decided in 2023 to cut back on drilling new natural gas wells in the Haynesville Shale field in eastern Texas and northern Louisiana. Briefly explain how Chesapeake's decision will affect the firm's marginal cost of producing oil.

4.6 Is it possible for average total cost to be decreasing over a range of output where marginal cost is increasing? Briefly explain.

4.7 Stellantis NV is an automobile manufacturer formed in 2021 by a merger between Fiat Chrysler Automobiles and France's PSA Group. In the spring of 2023, Stellantis announced it would reduce its manufacturing costs by offering buyouts to 31,000 of the company's hourly employees and 2,500 of its salaried workers who are employed in the United States. A spokesperson for Stellantis cited the need to control costs as the company invests in the production of electric vehicles.

- **a.** Will the decrease in the number of hourly employees reduce Stellantis's variable costs or its fixed costs? Briefly explain.
- **b.** Will the decrease in the number of number of salaried employees reduce Stellantis's variable costs or its fixed costs? Briefly explain.
- **c.** Will the decrease in the number of hourly and salaried employees reduce Stellantis's explicit costs or its implicit costs? Briefly explain.

4.8 Suppose a firm has no fixed costs, so all its costs are variable, even in the short run.

- **a.** If the firm's marginal costs are continually increasing (that is, marginal cost is increasing from the first unit of output produced), will the firm's average total cost curve have a U shape? Briefly explain.
- **b.** If the firm's marginal costs are $5 at every level of output, what shape will the firm's average total cost have?

4.9 **[Related to Solved Problem 11.4]** Santiago Delgado owns a copier store. He leases two copy machines for which he pays $20 each per day. He cannot increase the number of machines he leases without giving the office machine company six weeks' notice. He can hire as many workers as he wants at a cost of $40 per day per worker. These are the only two inputs he uses to produce copies.

- **a.** Fill in the remaining columns in the following table.
- **b.** Draw the average total cost curve and marginal cost curve for Santiago's store. Do these curves have the expected shapes? Briefly explain.

Quantity of Workers	Quantity of Copies per Day	Fixed Cost	Variable Cost	Total Cost	Average Total Cost	Marginal Cost
0	0					
1	600					
2	1,100					
3	1,500					
4	1,800					
5	2,000					
6	2,100					

4.10 Is Jill Johnson correct when she states the following: "I am currently producing 10,000 pizzas per month at a total cost of $50,000. If I produce 10,001 pizzas, my total cost will rise to $50,011. Therefore, my marginal cost of producing pizzas must be increasing." Draw a graph to illustrate your answer.

4.11 Is Jill Johnson correct when she states the following: "I am currently producing 20,000 pizzas per month at a total cost of $75,000. If I produce 20,001 pizzas, my total cost will rise to $75,002. Therefore, my marginal cost of producing pizzas must be increasing." Draw a graph to illustrate your answer.

4.12 (This problem is somewhat advanced.) Using symbols, we can write that the marginal product of labor is equal to $\Delta Q/\Delta L$. Marginal cost is equal to $\Delta TC/\Delta Q$. Because fixed costs by definition don't change, marginal cost is also equal to $\Delta VC/\Delta Q$. If Jill Johnson's only variable cost (VC) is labor cost, then her variable cost equals the wage multiplied by the quantity of workers hired, or wL.

- **a.** If the wage Jill pays is constant, then what is ΔVC in terms of w and L?
- **b.** Use your answer to part (a) and the expressions given for the marginal product of labor and the marginal cost of output to find an expression for marginal cost,

$\Delta TC/\Delta Q$, in terms of the wage, w, and the marginal product of labor, $\Delta Q/\Delta L$.

c. Use your answer to part (b) to determine Jill's marginal cost of producing pizzas if the wage is $750 per week and the marginal product of labor is 150 pizzas. If the wage falls to $600 per week and the marginal product of labor is unchanged, what happens to Jill's marginal cost? If the wage is unchanged at $750 per week and the marginal product of labor rises to 250 pizzas, what happens to Jill's marginal cost?

11.5 Graphing Cost Curves

LEARNING OBJECTIVE: Graph average total cost, average variable cost, average fixed cost, and marginal cost.

Summary

Average fixed cost is equal to fixed cost divided by the level of output. **Average variable cost** is equal to variable cost divided by the level of output. Figure 11.5 shows the relationship among marginal cost, average total cost, average variable cost, and average fixed cost. It is one of the most important graphs in microeconomics.

Review Questions

5.1 Where does the marginal cost curve intersect the average variable cost curve and the average total cost curve?

5.2 As the level of output increases, what happens to the difference between the value of average total cost and the value of average variable cost?

Problems and Applications

5.3 A column on barrons.com discussing General Motors (GM) made the following observation: "Even the seemingly 'variable' costs of hourly workers were made burdensome by union agreements whereby 95% of hourly workers' salaries were paid when they were laid off, turning variable labor compensation into a fixed cost."

a. Aren't workers' salaries always a variable cost and not a fixed cost? Briefly explain the author's reasoning.

b. Suppose that GM reduces its production of cars. Compare what happens to GM's average total cost production in a situation where (i) the company doesn't have this union agreement, and (ii) the company does have this agreement. Use a graph to illustrate your answer.

5.4 Suppose the total cost of producing 10,000 tennis balls is $30,000, and the fixed cost is $10,000.

a. What is the amount of the variable cost in this situation?

b. When output is 10,000, what are the average variable cost and the average fixed cost?

c. Assume that the cost curves have the usual shape. Is the dollar difference between the average total cost and the average variable cost greater when the output is 10,000 tennis balls or when the output is 30,000 tennis balls? Briefly explain.

5.5 An article on bloomberg.com discussed the situation at the mining firm BHP Billiton Ltd., which is headquartered in Australia: "The fixed element of mining costs doesn't change much, regardless of how many tons are being produced, so the declines in output . . . pushed up the average [cost per ton]."

a. What does the article mean by the "fixed element of mining cost"? Give an example.

b. Will a reduction in a firm's output always result in an increase in the firm's average total cost of production? Use a graph to illustrate your answer.

5.6 In the ancient world, a book could be produced either on a scroll or as a codex, which was made of folded sheets glued together, something like a modern book. One scholar has estimated the following variable costs (in Greek drachmas) of the two methods:

	Scroll	Codex
Cost of writing (wage of a scribe)	11.33 drachmas	11.33 drachmas
Cost of paper	16.50 drachmas	9.25 drachmas

Another scholar points out that a significant fixed cost was involved in producing a codex:

> In order to copy a codex . . . the amount of text and the layout of each page had to be carefully calculated in advance to determine the exact number of sheets . . . needed. No doubt, this is more time-consuming and calls for more experimentation than the production of a scroll would. But for the next copy, these calculations would be used again.

a. Suppose that the fixed cost of preparing a codex was 58 drachmas and that there was no similar fixed cost for a scroll. Would an ancient book publisher who intended to sell 5 copies of a book be likely to publish it as a scroll or as a codex? What if the publisher intended to sell 10 copies? Briefly explain.

b. Although most books were published as scrolls in the first century C.E., by the third century, most were published as codices. Considering only the factors mentioned in this problem, explain why this change may have taken place.

5.7 Some colleges and private companies have launched online courses that anyone with an internet connection can take. The most successful of these massive open online courses (MOOCs) have attracted tens of thousands of students. Suppose that your college offers a MOOC and spends a total of $200,000 on one-time costs to have instructors prepare the course material and buy additional server capacity. The college administration estimates that the variable cost of offering the course will be $20 per student per course. This variable cost is the same, regardless of how many students enroll in the course.

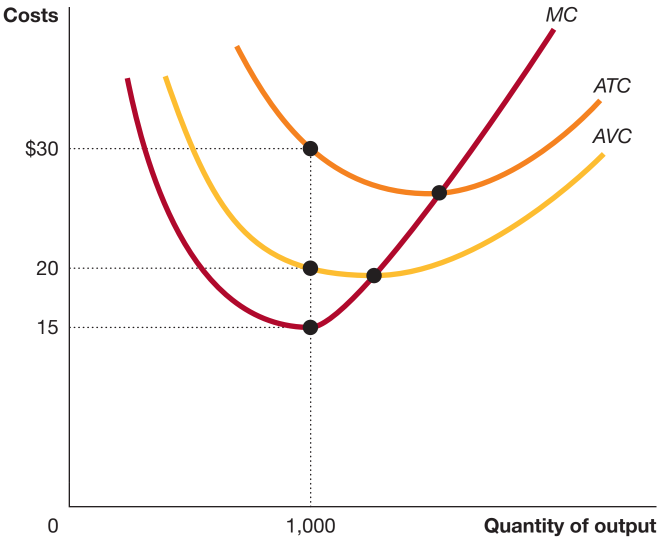
a. Use the information provided to fill in the missing values in the following table.

Number of Students Taking the Course	Average Total Cost	Average Variable Cost	Average Fixed Cost	Marginal Cost
1,000				
10,000				
20,000				

b. Use your answer to part (a) to draw a cost curve graph to illustrate your college's costs of offering this course. Your graph should measure cost on the vertical axis and the number of students taking the course on the horizontal axis. Be sure your graph contains the following curves: average total cost, average variable cost, average fixed cost, and marginal cost.

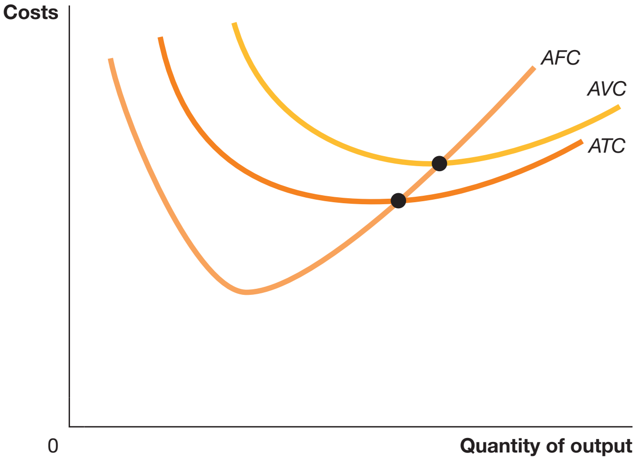
5.8 An article on barrons.com discussed the advice of an investment analyst about which firms to invest in if you were expecting an economic expansion during which the demand for many goods would increase. According to the analyst, "You want very high fixed-cost businesses. . . . What you want is something like a copper mine. Any . . . pickup in economic activity would help it a lot." Briefly explain the analyst's reasoning.

5.9 **[Related to Solved Problem 11.5]** Use the information in the graph to find the values for the following costs at an output level of 1,000.



a. Marginal cost
b. Total cost
c. Variable cost
d. Fixed cost

5.10 **[Related to Solved Problem 11.5]** List the errors in the following graph. Carefully explain why the curves drawn this way are incorrect. In other words, why can't these curves be as they are shown in the graph?



5.11 **[Related to the Chapter Opener]** Jaden owns an accounting firm that sells tax preparation services in the Houston area. His only fixed cost is a software program that he leases for $4,000 per month. He decides to replace the software program he has been using with a generative AI program, similar to ChatGPT, which we discussed in the chapter opener. Jaden will need to pay $2,000 per month to lease the AI program. Draw a graph illustrating the effect of using the AI program on the cost curves of Jaden's firm. Be sure to show the original average total cost, average variable cost, average fixed cost, and marginal cost curves and the shifts—if any—in the curves after Jaden begins using the AI program.

5.12 Explain how the events listed in (a) through (d) would affect the following costs at Southwest Airlines:

1. Marginal cost
2. Average variable cost
3. Average fixed cost
4. Average total cost
   - **a.** Southwest signs a new contract with the Transport Workers Union that requires the airline to increase wages for its flight attendants.
   - **b.** The federal government starts to levy a $20-per-passenger carbon emissions tax on all commercial air travel.
   - **c.** Southwest buys chatbot software that allows it to reduce the number of customer service representatives by half.
   - **d.** Southwest decides to double its television advertising budget.

11.6 Costs in the Long Run

LEARNING OBJECTIVE: Explain how firms use the long-run average cost curve in their planning.

Summary

The **long-run average cost curve** shows the lowest cost at which a firm is able to produce a given level of output in the long run. For many firms, the long-run average cost curve falls as output expands because of **economies of scale**. **Minimum efficient scale** is the level of output at which all economies of scale have been exhausted. After economies of scale have been exhausted, firms experience **constant returns to scale**, where their long-run average cost curve is flat. At high levels of output, the long-run average cost curve turns up as the firm experiences **diseconomies of scale**.

Review Questions

6.1 What is the difference between total cost and variable cost in the long run?
6.2 What are economies of scale? What are four reasons that firms may experience economies of scale?
6.3 What are diseconomies of scale? What is the main reason that a firm eventually encounters diseconomies of scale as it keeps increasing the size of its store or factory?
6.4 Why can short-run average cost never be less than long-run average cost for a given level of output?

Problems and Applications

6.5 Apple has been considering developing a car that would become available in 2026. If the company goes forward with the plan, it intends to contract with another firm to manufacture the cars. A news article quoted an industry analyst as saying, "In order to have a viable assembly plant, you need 100,000 vehicles annually, with more volume to come." Otherwise, the analyst said, the plant would not reach minimum efficient scale. What is minimum efficient scale? What is likely to happen in the long run to Apple's car business if the plant manufacturing its cars does not reach minimum efficient scale?

6.6 Many of the firms that were the first to use fracking techniques to produce oil were small. By 2018, though, many large oil companies, such as Chevron and ExxonMobil, had begun using fracking techniques. An article in the *Wall Street Journal* quotes an industry analyst as arguing that "these bigger companies have the scale to build or finance infrastructure and secure the best equipment and supplies." The article then notes, "The 'bigger is better' mantra has started pushing smaller operators toward a new era of consolidation in fracking." Assuming that this analysis is correct, illustrate the cost situation in fracking by drawing a graph that contains the long-run average cost curve for a smaller oil firm and one for a large oil firm.

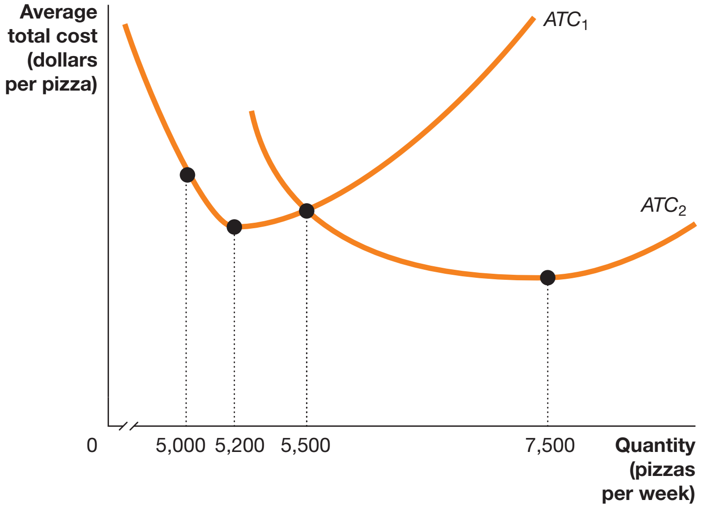
6.7 In describing the optimal size of an investment fund, a writer for the *Wall Street Journal* observed:

> At first, bigger is better for both investors and managers. . . . Managing money is expensive. Small funds have many fixed costs. . . . If a fund is small, it can't generate enough fees to cover costs. . . . The result is that in terms of performance, funds should want to get big to cover costs and maximize returns, but not so big that diseconomies of scale erode returns.

Draw a graph of a long-run average cost curve for a typical firm in the investment fund industry. In your graph, draw and label the following.

a. A short-run average total cost curve for an investment fund that has not reached minimum efficient scale
b. A short-run average total cost curve for an investment fund that has reached minimum efficient scale
c. A short-run average total cost curve for an investment fund that experiences diseconomies of scale
d. A range of output within which investment funds experience constant returns to scale

6.8 [Related to the Economics in Your Life & Career] Suppose that Jill Johnson has to choose between building a smaller restaurant and building a larger restaurant. In the following graph, the relationship between costs and output for the smaller restaurant is represented by the curve ATC_1, and the relationship between costs and output for the larger restaurant is represented by the curve ATC_2.



a. If Jill expects to produce 5,100 pizzas per week, should she build a smaller restaurant or a larger restaurant? Briefly explain.
b. If Jill expects to produce 6,000 pizzas per week, should she build a smaller restaurant or a larger restaurant? Briefly explain.
c. A student asks, "If the average cost of producing pizzas is lower in the larger restaurant when Jill produces 7,500 pizzas per week, why isn't it also lower when Jill produces 5,200 pizzas per week?" Give a brief answer to the student's question.

6.9 [Related to Solved Problem 11.6] In 2023, the supermarket chains Kroger and Albertsons proposed merging to form a single firm. Before the merger, they were the fourth and fifth largest supermarket chains in the United States, behind Walmart, Amazon (which owns Whole Foods), and Costco. According to an article in the *Wall Street Journal*, the companies argued that a merger "would help them boost their scale and technology, and better compete with larger rivals." Another article stated that according to an industry analyst, the combined firm's costs would fall by $1 billion to $3 billion.

a. Assume that the two firms and the industry analyst are correct about the situation before the merger. Draw a graph representing the long-run average cost curve for (i) Walmart's or Costco's grocery business and (ii) for Kroger or Albertsons.

b. Suppose that Kroger and Albertsons merge. Draw a graph showing the result for the newly merged firm's long-run average cost curve.

6.10 **[Related to the Apply the Concept "The Colossal River Rouge Plant: Diseconomies of Scale at Ford Motor Company"]** Suppose that Henry Ford had continued to experience economies of scale, no matter how large the automobile factory he built. Discuss what the implications of this would have been for the automobile industry.

6.11 In 2007, the European airplane manufacturer Airbus began selling its "super jumbo" jet, the A380. By 2019, smaller jets using carbon fiber parts and more efficient engines were also on the market. According to an article in the *Wall Street Journal*, "Airlines, it turns out, preferred [the smaller jets] to the A380 and Boeing's own humpbacked giant, the 747. The smaller jets were easier to fill and could fly direct to more places around the world without funneling through hubs."

a. What does the observation that the smaller jets were easier to fill with passengers imply about the average cost of flying a passenger in a smaller jet and in an A380?

b. Does your answer to part (a) mean that there are no economies of scale with respect to jets? Briefly explain.

6.12 **[Related to the Don't Let This Happen to You]** In his autobiography, T. Boone Pickens, a geologist, entrepreneur, and oil company executive, wrote:

> It's unusual to find a large corporation that's efficient. . . . When you get an inside look, it's easy to see how inefficient big business really is. Most corporate bureaucracies have more people than they have work.

Was Pickens describing diminishing returns or diseconomies of scale? Briefly explain.

6.13 **[Related to the Don't Let This Happen to You]** In 2023, an article in the *Wall Street Journal* quoted Michael Hsu, the acting federal comptroller of the currency, as saying that some banks have become so large and complex "that control failures, risk management breakdowns, and negative surprises occur too frequently. Not because of weak management, but because of the sheer size and complexity of the organization." After reading this article, a student remarks, "It seems that some large banks are suffering from diminishing returns." Briefly explain whether you agree with this remark.

Critical Thinking Exercises

CT11.1 Pick five firms from articles you find in news sources such as cnn.com, bloomberg.com, the *Wall Street Journal*, or the *New York Times* and describe the technology that each firm uses for its major product. Be sure to describe each firm's major inputs and outputs.

CT11.2 Chapter 1 described how economists use marginal analysis, and Chapter 10 used marginal analysis to understand consumer behavior. This chapter introduces another specific part of marginal analysis: marginal cost (*MC*). Suppose that a firm is thinking of expanding production by hiring more workers, who will help the firm produce more goods. The firm's managers calculate that the additional cost of hiring more workers is less than the additional revenue (also called marginal revenue, *MR*) from selling more goods. Briefly explain whether you think the firm should expand production.

CT11.3 Often, many firms in an industry are located in the same geographic area. Examples include Hollywood (movies), Silicon Valley (information technology), Wall Street (finance), and Dalton, Georgia (carpets). Provide an additional example of firms in the same industry locating close together in a city or a state. Use the concepts from this chapter to explain why firms in an industry might decide to locate near each other.

CT11.4 Over the past 30 years in the United States, there has been a great expansion in the number of beer brewers. Can you think of two reasons this expansion might have occurred? Use concepts from this chapter and Chapter 10 in your answer.

12 Firms in Perfectly Competitive Markets

Are Cage-Free Eggs the Road to Riches?

Consumer demand for healthier foods continues to increase. Many people also want animals raised for food to be treated humanely. More than 65,000 farms in the United States specialize in producing eggs. Until a few years ago, most farmers raised chickens in cages that restricted their movement. Some farmers, though, began selling eggs laid by "cage-free" chickens. These chickens have significant room to move around, although they are still usually kept indoors.

Some consumers are willing to pay more for eggs laid by cage-free chickens, and by 2015, consumer demand for cage-free eggs had increased so much that farmers were able to sell them for double the price of conventionally produced eggs. But these farmers also faced higher costs for three key reasons: (1) Fewer chickens can be raised in an area of a given size, (2) the chickens eat more because they are moving around, and (3) some chickens die from being pecked by other chickens. For a time, the higher price of cage-free eggs more than offset the higher cost, resulting in a larger profit.

But the profitability of selling cage-free eggs began declining even though consumer demand had led firms like Panera Bread, Dunkin', and McDonald's to pledge to begin using only cage-free eggs and the states of California, Colorado, and Massachusetts had enacted laws requiring that all eggs sold in those states be cage free. While you might expect that the increase in demand increased profits, the increase in demand was offset by more farmers using cage-free methods. As one egg farmer put it: "Farming is about making a profit, and if someone is willing to pay us extra, we're going to do that."

A severe epidemic of avian flu affected both cage-free and conventional poultry in the United States beginning in 2022 and extending into 2023. As a result of the epidemic, more than 58 million chickens died of the disease or had to be destroyed by farmers. Despite the disruption caused by the epidemic, the long-term trend toward more farmers using cage-free methods continued. For instance, according to data from the U.S. Department of Agriculture (USDA), in early 2023, U.S. farms had more than 114 million cage-free chickens, which was about 38 percent of all egg-laying chickens in the United States. Cage-free chickens accounted for about 20 percent of total egg production in the United States, an increase from 10 percent in 2016. The USDA projected that by 2026, 64 percent of all chickens in the United States would be cage free. The supply of cage-free eggs was growing more rapidly than the demand, causing the premium over the price of conventional eggs to shrink. As the president of Egg Innovations, the largest producer of cage-free eggs in the United States, put it: "Cage-free is going to be a commodity egg" that will no longer be more profitable to produce than conventional eggs.

Alan Hopps/Moment Open/Getty Images

Some egg farmers have turned to selling "pastured eggs" laid by chickens that are allowed to roam freely outside. Chickens raised this way have more room to move around than do chickens raised cage free indoors, but they are more costly to raise than chickens raised using either conventional or cage-free methods. In 2023, farmers could still sell pastured eggs for prices much higher than they could get for cage-free eggs. But would that price premium last, or would it decline to the point that pastured eggs would become no more profitable than cage-free or conventional eggs?

The process of new firms entering a market and driving down prices and profits occurs not only in agriculture. Throughout the economy, entrepreneurs are continually introducing new products or new ways of making products, which—when successful—enable them to earn an economic profit in the short run. But in the long run, competition among firms forces prices to the level where they just cover the costs of production. In this chapter, we focus on the process of competition, which is the heart of the market system.

Chapter Outline & Learning Objectives

12.1 Perfectly Competitive Markets, page 419
Explain what a perfectly competitive market is and why a perfect competitor faces a horizontal demand curve.

12.2 How a Firm Maximizes Profit in a Perfectly Competitive Market, page 422
Explain how a firm maximizes profit in a perfectly competitive market.

12.3 Illustrating Profit or Loss on the Cost Curve Graph, page 425
Use graphs to show a firm's profit or loss.

12.4 Deciding Whether to Produce or to Shut Down in the Short Run, page 429
Explain why firms may shut down temporarily.

12.5 "If Everyone Can Do It, You Can't Make Money at It": The Entry and Exit of Firms in the Long Run, page 434
Explain how entry and exit ensure that perfectly competitive firms earn zero economic profit in the long run.

12.6 Perfect Competition and Economic Efficiency, page 442
Explain how perfect competition leads to economic efficiency.

Economics in Your Life & Career

Are You an Entrepreneur?

Were you an entrepreneur during high school? If you babysat or mowed lawns for your neighbors, you were essentially an entrepreneur running a small business. How did you decide what price to charge for your services? You may have wanted to charge $35 per hour, but you probably charged much less. As you read the chapter, think about the competitive situation you faced as a teenage entrepreneur and try to determine why the prices received by most people who babysit and mow lawns are so low. You can check your answer against the one we provide at the end of this chapter.

An *industry* refers to all the firms selling a particular good or service, such as eggs, automobiles, or life insurance. Poultry farming is an example of a *perfectly competitive* industry. Firms in perfectly competitive industries are unable to control the prices of the products they sell and are unable to earn an economic profit in the long run for two main reasons:

1. Firms in these industries sell identical products.
2. It is easy for new firms to enter these industries.

By studying perfectly competitive industries, we can better understand how markets answer the fundamental economic questions discussed in Chapter 1:

- What goods and services will be produced?
- How will the goods and services be produced?
- Who will receive the goods and services produced?

Most industries, though, are not perfectly competitive because firms do *not* produce identical products, and it may be difficult for new firms to enter some industries. There are thousands of industries in the United States. Although in some ways each industry is unique, industries share enough similarities that economists can group them into four *market structures*. In particular, any industry has three key characteristics:

1. The number of firms in the industry
2. The similarity of the good or service produced by the firms in the industry
3. The ease with which new firms can enter the industry

Economists use these characteristics to classify industries into the four market structures listed in Table 12.1.

Many industries, including restaurants, clothing stores, and other retailers, have a large number of firms selling products that are differentiated, rather than identical, and are in the *monopolistic competition* category. Some industries, such as streaming services and automobiles, have only a few firms and are *oligopolies*. Finally, a few industries, such as the delivery of first-class mail by the U.S. Postal Service, have only one firm and are *monopolies*. After discussing perfect competition in this chapter, we will devote a chapter to each of these other market structures.

Table 12.1

The Four Market Structures

	Market Structure			
Characteristic	**Perfect Competition**	**Monopolistic Competition**	**Oligopoly**	**Monopoly**
Number of firms	Many	Many	Few	One
Type of product	Identical	Differentiated	Identical or differentiated	Unique
Ease of entry	High	High	Low	Entry blocked
Examples of industries	• Growing wheat • Poultry farming	• Clothing stores • Restaurants	• Streaming services • Manufacturing automobiles	• First-class mail delivery • Providing tap water

12.1 Perfectly Competitive Markets

LEARNING OBJECTIVE: Explain what a perfectly competitive market is and why a perfect competitor faces a horizontal demand curve.

Why are firms in a **perfectly competitive market** unable to control the prices of the goods they sell, and why are the owners of these firms unable to earn an economic profit in the long run? We can begin our analysis by listing the three conditions that make a market perfectly competitive:

Perfectly competitive market A market that meets the conditions of having (1) many buyers and sellers, (2) all firms selling identical products, and (3) no barriers to new firms entering the market.

1. There must be many buyers and many firms, all of which are small relative to the market.
2. All firms in the market must sell identical products.
3. There must be no barriers to new firms entering the market.

All three of these conditions hold in markets for agricultural products. For example, no single consumer or producer of apples buys or sells more than a tiny fraction of the total apple crop. The apples sold by each apple grower are identical, and there are no barriers to a new firm entering this market by purchasing land and planting apple trees. As we will see, it is the existence of many firms, all selling the same good, that keeps any single apple farmer from affecting the price of apples.

Although the market for apples meets the conditions for perfect competition, the markets for most goods and services do not. In particular, the second and third conditions are very restrictive. In most markets that have many buyers and sellers, firms do not sell identical products. For example, not all restaurant meals are the same, nor is all women's clothing the same. In later chapters, we will explore the common situation of monopolistic competition where many firms are selling similar but not identical products. We will also analyze industries that are oligopolies, where entry of new firms is difficult, and industries that are monopolies, where entry of new firms is impossible. In this chapter, we concentrate on perfectly competitive markets so we can use them as a benchmark to analyze how firms behave when they face the maximum possible competition.

A Perfectly Competitive Firm Cannot Affect the Market Price

Prices in perfectly competitive markets are determined by the interaction of demand and supply for the good or service. The actions of any single consumer or any single firm have no effect on the market price. Consumers and firms have to accept the market price if they want to buy and sell in a perfectly competitive market.

Because a firm in a perfectly competitive market is very small relative to the market and because it is selling exactly the same product as every other firm, it can sell as much as it wants without having to lower its price. If a perfectly competitive firm tries to raise its price, it won't sell anything at all because consumers will switch to buying the product from the firm's competitors. Therefore, the firm will be a **price taker** and will have to charge the same price as every other firm in the market. Although we don't usually think of firms as being too small to affect the market price, consumers are often in the position of being price takers. For instance, suppose your local supermarket is selling bread for \$2.50 per loaf. You can load up your shopping cart with 20 loaves of bread, and the supermarket will gladly sell them all to you for \$2.50 per loaf. But if you go to the cashier and offer to buy the bread for \$2.49 per loaf, he or she will not sell it to you at that price. As a buyer, you are too small relative to the bread market to have any effect on the equilibrium price. Whether you leave the supermarket without buying any bread or you buy 20 loaves, you are unable to change the market price of bread by even 1 cent.

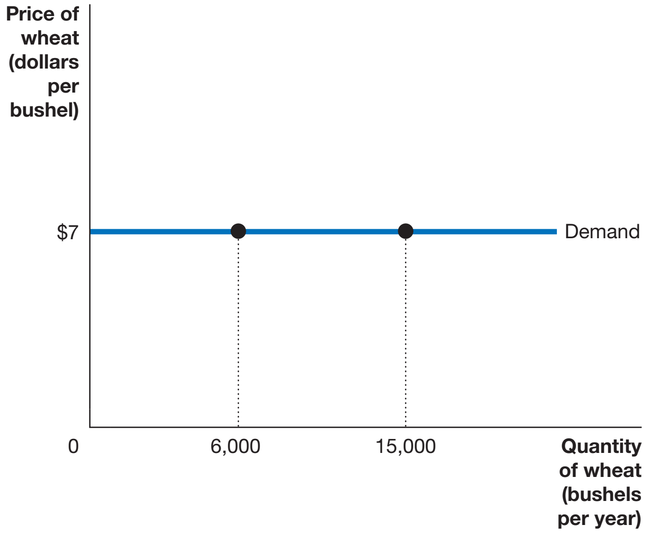
Price taker A buyer or seller that is unable to affect the market price.

The situation you face as a bread buyer is the same situation a wheat farmer faces as a wheat seller. There are about 150,000 farmers growing wheat in the United States. The market price of wheat is determined not by any individual wheat farmer but by the interaction of all the buyers and all the sellers in the wheat market. If any one wheat farmer has the best crop the farmer has ever had, or if any one wheat farmer stops growing wheat altogether, the market price of wheat will not be affected *because the market supply curve for wheat will not shift enough to change the equilibrium price by even 1 cent.*

Figure 12.1

A Perfectly Competitive Firm Faces a Horizontal Demand Curve

A firm in a perfectly competitive market is selling exactly the same product as all of the other firms in the market. Therefore, it can sell as much as it wants at the current market price, but it cannot sell anything at all if it raises the price by even 1 cent. As a result, the demand curve for a perfectly competitive firm's output is a horizontal line. In the figure, whether the wheat farmer sells 6,000 bushels or 15,000 bushels per year has no effect on the market price of $7.



The Demand Curve for the Output of a Perfectly Competitive Firm

Suppose Bill Parker grows wheat on a 250-acre farm in Washington. Farmer Parker is selling wheat in a perfectly competitive market, so he is a price taker. Because he can sell as much wheat as he chooses at the market price—but can't sell any wheat at all at a higher price—the demand curve for his wheat has an unusual shape: It is horizontal, as shown in Figure 12.1. With a horizontal demand curve, Farmer Parker must accept the market price, which in this case is $7 per bushel. Whether Farmer Parker sells 6,000 bushels per year or 15,000 has no effect on the market price.

The demand curve for Farmer Parker's wheat is very different from the market demand curve for wheat. Panel (a) of Figure 12.2 shows the market for wheat. The demand curve in panel (a) is the *market demand curve for wheat* and has the normal downward slope we are familiar with from the market demand curves in Chapter 3. Panel (b) of Figure 12.2 shows the demand curve for Farmer Parker's wheat, which is a horizontal line. By viewing these graphs side by side, you can see that the price Farmer Parker receives for his wheat in panel (b) is determined by the interaction of all sellers and all buyers of wheat in the wheat market in panel (a). Notice, however, that the scales on the horizontal axes in the two panels are very different. In panel (a), the equilibrium quantity of wheat is

Don't Let This Happen to You

Don't Confuse the Demand Curve for Farmer Parker's Wheat with the Market Demand Curve for Wheat

The demand curve for wheat has the normal downward-sloping shape. If the price of wheat goes up, the quantity of wheat demanded goes down, and if the price of wheat goes down, the quantity of wheat demanded goes up. But the demand curve for the output of a single wheat farmer is *not* downward sloping: It is a horizontal line. If an individual wheat farmer tries to increase the price he charges for his wheat, the quantity demanded falls to zero because buyers will purchase from any of the other 150,000 wheat farmers. But any one farmer can sell as much wheat as he or she can produce without needing to cut the price. Both of these features of this market result from each wheat farmer being very small relative to the overall market for wheat.

When we draw graphs of the wheat market, we usually show the market equilibrium quantity in millions or billions of bushels. When we draw graphs of the demand for wheat produced by one farmer, we usually show the quantity produced in smaller amounts, such as thousands of bushels. It is important to remember this difference in scale when interpreting these graphs.

Finally, it is not just wheat farmers who have horizontal demand curves for their products; *any firm in a perfectly competitive market faces a horizontal demand curve.*

Your Turn: Test your understanding by doing related problem 1.7 at the end of this chapter.

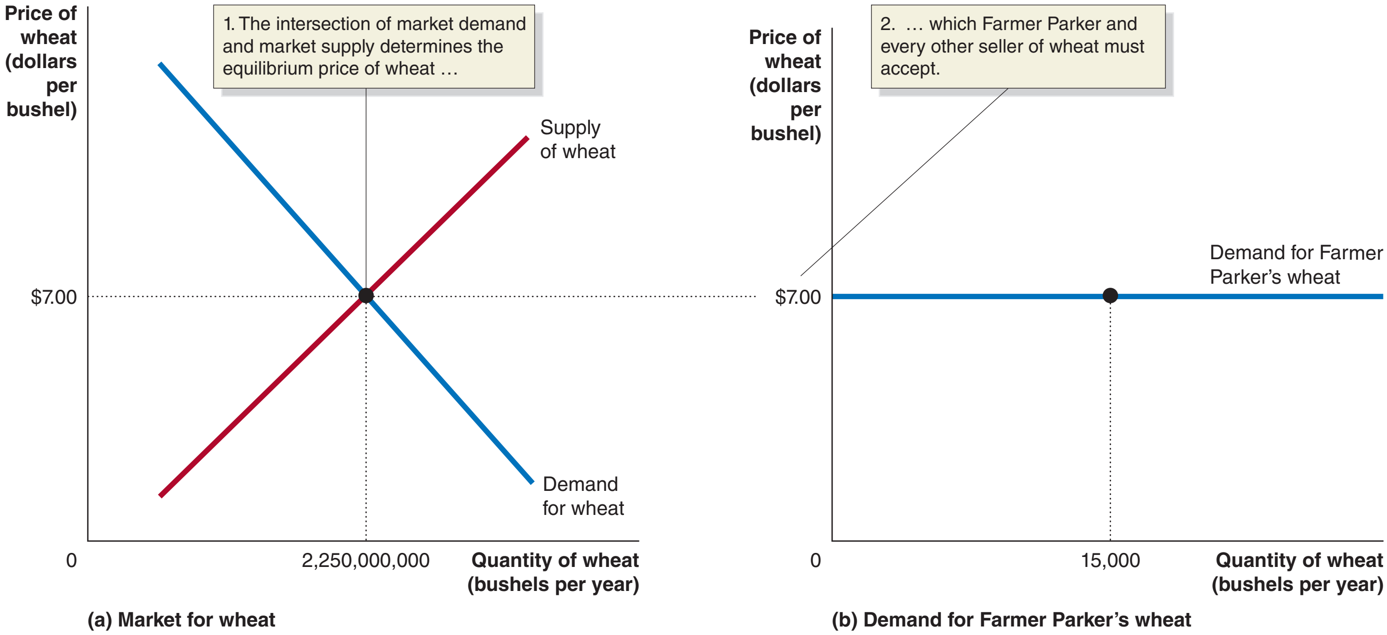


Figure 12.2 **The Market Demand for Wheat versus the Demand for One Farmer's Wheat**

In a perfectly competitive market, price is determined by the intersection of market demand and market supply. In panel (a), the demand and supply curves for wheat intersect at a price of $7 per bushel. An individual wheat farmer like Farmer Parker cannot affect the market price for wheat. Therefore, as panel (b) shows, the demand curve for Farmer Parker's wheat is a horizontal line. To understand this figure, it is important to notice that the scales on the horizontal axes in the two panels are very different. In panel (a), the equilibrium quantity of wheat is 2.25 *billion* bushels, and in panel (b), Farmer Parker is producing only 15,000 bushels of wheat.

2.25 *billion* bushels. In panel (b), Farmer Parker is producing only 15,000 bushels, or less than 0.001 percent of market output. We need to use different scales in the two panels so we can display both of them on one page. Keep in mind this key point: Farmer Parker's output of wheat is very small relative to the total market output.

Market Equilibrium, the Invisible Hand, and Spontaneous Order

Our discussion of the wheat market is an example of a key paradox of the market system: Even though no one individual consumer or firm can affect the price of a good or how much of the good is produced, collectively consumers and firms determine the equilibrium quantity and price. When you choose to buy cage-free eggs rather than conventional eggs, your additional purchases don't affect the equilibrium in the egg market. But as consumers *collectively* buy more cage-free eggs, the total quantity of cage-free eggs supplied increases and the total quantity of conventional eggs supplied declines. Similarly, the decision of one egg farmer to switch from supplying conventional eggs to supplying cage-free eggs doesn't by itself affect the equilibrium in the egg market. But as egg farmers collectively switch the type of eggs they supply, the quantity of cage-free eggs increases and the quantity of conventional eggs declines.

As we noted in Chapter 2, Section 2.3, Adam Smith described the market mechanism as a process of individuals acting as if guided by an *invisible hand* to achieve a result that they may not have intended and individually could not achieve. The equilibrium mix of egg types does not change based on whether you as an individual buy cage-free eggs or whether an individual egg farmer decides to supply them. Instead, the equilibrium mix is determined by the decisions of individuals as they interact in markets.

In the twentieth century, the philosopher Michael Polanyi called this process *spontaneous order*. Equilibrium in a perfectly competitive market is achieved through the interactions of many consumers and firms without any centralized decision making and without any individual intending to achieve what turns out to be the equilibrium result.

We can see a noneconomic example of spontaneous order by observing a city after a snowstorm. Each individual family shovels out the sidewalk in front of their home to clear a path for themselves. Even though no one family shovels more than a small stretch of the sidewalk, collectively the result is that the sidewalk for the whole block is cleared of snow, *without anyone organizing the work or directly intending the result.*

12.2 How a Firm Maximizes Profit in a Perfectly Competitive Market

LEARNING OBJECTIVE: Explain how a firm maximizes profit in a perfectly competitive market.

Profit Total revenue minus total cost.

Farmer Parker cannot control the price of his wheat, so how does he decide how much wheat to produce? We assume that Farmer Parker's objective is to maximize profit. This assumption is reasonable for most firms most of the time. Remember that **profit** is the difference between total revenue (TR) and total cost (TC):

$$\text{Profit} = TR - TC.$$

To maximize his profit, Farmer Parker should produce the quantity of wheat where the difference between the total revenue he receives and his total cost is as large as possible.

Revenue for a Firm in a Perfectly Competitive Market

To understand how Farmer Parker maximizes profit, let's first consider his revenue. To keep the numbers simple, we will assume that he owns a very small farm and produces at most 10 bushels of wheat per year. Table 12.2 shows the revenue Farmer Parker will earn from selling various quantities of wheat if the market price for wheat is $7.

Average revenue (*AR*) Total revenue divided by the quantity of the product sold.

The third column in Table 12.2 shows that Farmer Parker's *total revenue* rises by $7 for every additional bushel he sells because he can sell as many bushels as he wants at the market price of $7 per bushel. The fourth and fifth columns in the table show Farmer Parker's *average revenue* and *marginal revenue* from selling wheat. His **average revenue (*AR*)** equals his total revenue divided by the quantity of bushels he sells. For example, if he sells 5 bushels for a total of $35, his average revenue is $\$35/5 = \$7$. Notice that his average revenue is also equal to the market price of $7. In fact, for any level of output, a firm's average revenue is always equal to the market price. To see why, first note that total revenue equals price times quantity ($TR = P \times Q$), and average revenue equals total revenue divided by quantity ($AR = TR/Q$). Therefore, $AR = TR/Q = (P \times Q)/Q = P$.

Table 12.2

Farmer Parker's Revenue from Wheat Farming

(1) Number of Bushels (*Q*)	(2) Market Price (per bushel) (*P*)	(3) Total Revenue (*TR*)	(4) Average Revenue (*AR*)	(5) Marginal Revenue (*MR*)
0	$7	$0	—	—
1	7	7	$7	$7
2	7	14	7	7
3	7	21	7	7
4	7	28	7	7
5	7	35	7	7
6	7	42	7	7
7	7	49	7	7
8	7	56	7	7
9	7	63	7	7
10	7	70	7	7

Farmer Parker's **marginal revenue (*MR*)** is the change in his total revenue from selling 1 more bushel:

Marginal revenue (*MR*) The change in total revenue from selling one more unit of a product.

$$\text{Marginal revenue} = \frac{\text{Change in total revenue}}{\text{Change in quantity}}, \text{ or } MR = \frac{\Delta TR}{\Delta Q}.$$

Each additional bushel Farmer Parker sells always adds $7 to his total revenue, so his marginal revenue is $7. Farmer Parker's marginal revenue is $7 per bushel because he is selling wheat in a perfectly competitive market and can sell as much as he wants at the market price. In fact, Farmer Parker's marginal revenue and average revenue are both equal to the market price. This point is important: *For a firm in a perfectly competitive market, price is equal to both average revenue and marginal revenue.*

Determining the Profit-Maximizing Level of Output

To determine how Farmer Parker can maximize profit, we have to consider his costs as well as his revenue. A wheat farmer has many costs, including the costs of seed and fertilizer, as well as the wages of farm workers. In Table 12.3, we bring together the revenue data from Table 12.2 with cost data for Farmer Parker's farm. Recall that a firm's *marginal cost* is the increase in total cost resulting from producing another unit of output.

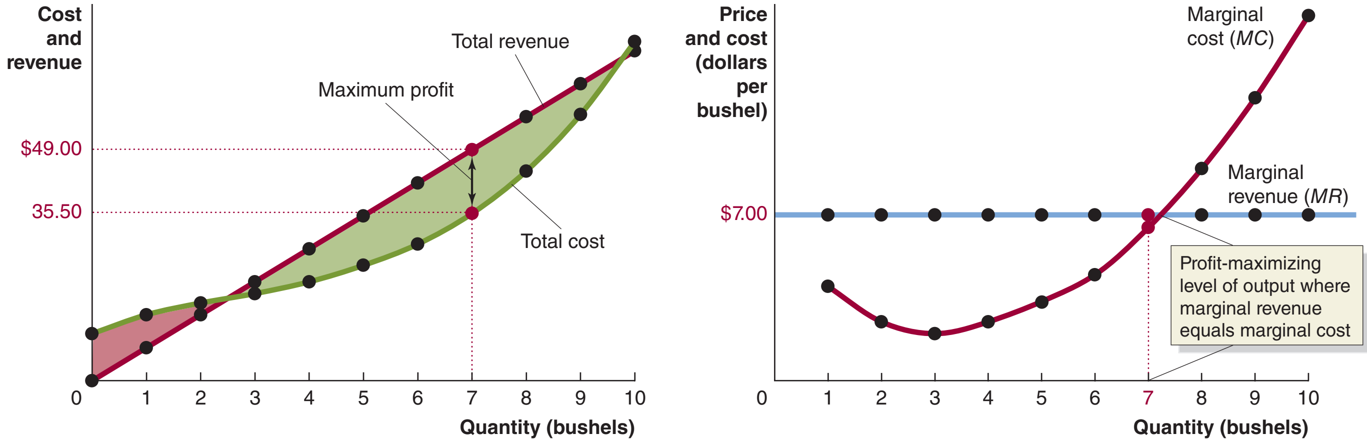
We calculate profit in the fourth column by subtracting total cost in the third column from total revenue in the second column. The fourth column shows that as long as Farmer Parker produces between 3 and 9 bushels of wheat, he will earn a profit. His maximum profit is $13.50, which he will earn by producing 7 bushels of wheat. Because Farmer Parker wants to maximize his profit, we would expect him to produce 7 bushels of wheat. Producing more than 7 bushels reduces his profit. For example, if he produces 8 bushels of wheat, his profit will decline from $13.50 to $11.50. The values for marginal cost given in the last column of the table help us understand why Farmer Parker's profit will decline if he produces more than 7 bushels of wheat: After the seventh bushel of wheat, rising marginal cost causes Farmer Parker's profit to decline.

In fact, comparing the marginal cost and marginal revenue at each level of output is an alternative method of calculating Farmer Parker's profit. We illustrate the two methods of calculating profit in Figure 12.3. We show the total revenue and total cost approach in panel (a) and the marginal revenue and marginal cost approach in panel (b). Total revenue is a straight line on the graph in panel (a) because total revenue increases at a constant rate of $7 for each additional bushel sold. Farmer Parker's profit is maximized when the vertical distance between the line representing total revenue and the total cost curve is as large as possible. Just as we saw in Table 12.3, his maximum profit occurs at an output of 7 bushels.

Table 12.3

Farmer Parker's Profit from Wheat Farming

(1) Quantity (bushels) (*Q*)	(2) Total Revenue (*TR*)	(3) Total Cost (*TC*)	(4) Profit (*TR* – *TC*)	(5) Marginal Revenue (*MR*)	(6) Marginal Cost (*MC*)
0	$0.00	$10.00	–$10.00	—	—
1	7.00	14.00	–7.00	$7.00	$4.00
2	14.00	16.50	–2.50	7.00	2.50
3	21.00	18.50	2.50	7.00	2.00
4	28.00	21.00	7.00	7.00	2.50
5	35.00	24.50	10.50	7.00	3.50
6	42.00	29.00	13.00	7.00	4.50
7	49.00	35.50	13.50	7.00	6.50
8	56.00	44.50	11.50	7.00	9.00
9	63.00	56.50	6.50	7.00	12.00
10	70.00	72.00	–2.00	7.00	15.50



(a) Total revenue, total cost, and profit

(b) Marginal revenue and marginal cost

Figure 12.3 **The Profit-Maximizing Level of Output**

In panel (a), Farmer Parker maximizes his profit at a quantity of 7 bushels, where the positive vertical distance between total revenue ($49.00) and total cost ($35.50) is the largest. Panel (b) shows that Farmer Parker's marginal revenue (*MR*) is equal to a constant $7 per bushel. He maximizes profit by producing wheat up to the point where the marginal revenue of the last bushel produced is equal to its marginal cost, or *MR* = *MC*. In this case, at no level of output does marginal revenue exactly equal marginal cost. The closest Farmer Parker can come is to produce 7 bushels of wheat. He will not want to continue to produce once marginal cost is greater than marginal revenue because doing so would reduce his profit. Panels (a) and (b) show alternative ways of thinking about how Farmer Parker can determine the profit-maximizing quantity of wheat to produce.

The last two columns of Table 12.3 show the marginal revenue (*MR*) Farmer Parker receives from selling another bushel of wheat and his marginal cost (*MC*) of producing another bushel of wheat. Panel (b) of Figure 12.3 plots Farmer Parker's marginal revenue and marginal cost. Because marginal revenue is always equal to $7, it is a horizontal line at the market price. We have already seen that the demand curve for a perfectly competitive firm is also a horizontal line at the market price. *Therefore, the marginal revenue curve for a perfectly competitive firm is the same as its demand curve*. Farmer Parker's marginal cost of producing wheat first falls and then rises, following the usual pattern we discussed in Chapter 11, Section 11.4.

We know from panel (a) that profit is at a maximum at 7 bushels of wheat. In panel (b), profit is also at a maximum at 7 bushels of wheat. To understand why profit is maximized at the level of output where marginal revenue equals marginal cost, remember this key economic principle: *Optimal decisions are made at the margin*. Firms use this principle to decide the quantity of a good to produce. In deciding how much wheat to produce, Farmer Parker needs to compare the marginal revenue he earns from selling another bushel of wheat to the marginal cost of producing that bushel. The difference between the marginal revenue and the marginal cost is the additional profit (or loss) from producing one more bushel. As long as marginal revenue is greater than marginal cost, Farmer Parker's profit is increasing, and he will want to expand production. For example, he will not stop producing at 6 bushels of wheat because producing and selling the seventh bushel adds $7.00 to his revenue but only $6.50 to his cost, so his profit increases by $0.50. He wants to continue producing until the marginal revenue he receives from selling another bushel is equal to the marginal cost of producing it. At that level of output, he will make no *additional* profit by selling another bushel, so he will have maximized his profit.

By inspecting Table 12.3, we can see that there is no level of output at which marginal revenue exactly equals marginal cost. The closest Farmer Parker can come is to produce 7 bushels of wheat. He will not want to produce additional wheat once marginal cost is greater than marginal revenue because doing so would reduce his profit. For example, the eighth bushel of wheat adds $9.00 to his cost but only $7.00 to his revenue, so producing the eighth bushel *reduces* his profit by $2.00.

From the information in Table 12.3 and Figure 12.3, we can draw the following conclusions:

1. The profit-maximizing level of output is where the positive difference between total revenue and total cost is the greatest.
2. The profit-maximizing level of output is also where marginal revenue equals marginal cost, or $MR = MC$.

Both of these conclusions are true for any firm, whether or not it is in a perfectly competitive industry. We can draw one other conclusion about profit maximization: For firms in a perfectly competitive industry (and *only* for those firms), price is equal to marginal revenue, or $P = MR$. So we can restate the $MR = MC$ condition as $P = MC$.

12.3 Illustrating Profit or Loss on the Cost Curve Graph

LEARNING OBJECTIVE: Use graphs to show a firm's profit or loss.

We have seen that profit is the difference between total revenue and total cost. We can also express profit in terms of *average total cost* (*ATC*). This approach allows us to show profit on the cost curve graph we developed in Chapter 11, Section 11.5.

We need to work through a few steps to determine the relationship between profit and average total cost. Because profit is equal to total revenue (*TR*) minus total cost (*TC*), and total revenue is price multiplied by quantity, we can write the following:

$$\text{Profit} = (P \times Q) - TC.$$

If we divide both sides of this equation by Q, we have:

$$\frac{\text{Profit}}{Q} = \frac{(P \times Q)}{Q} - \frac{TC}{Q},$$

or, because TC/Q equals ATC:

$$\frac{\text{Profit}}{Q} = P - ATC.$$

This equation tells us that profit per unit (or average profit) equals price minus average total cost. Finally, we obtain the equation for the relationship between total profit and average total cost by multiplying by Q:

$$\text{Profit} = (P - ATC) \times Q.$$

This equation tells us that a firm's total profit is equal to the difference between price and average total cost multiplied by the quantity produced.

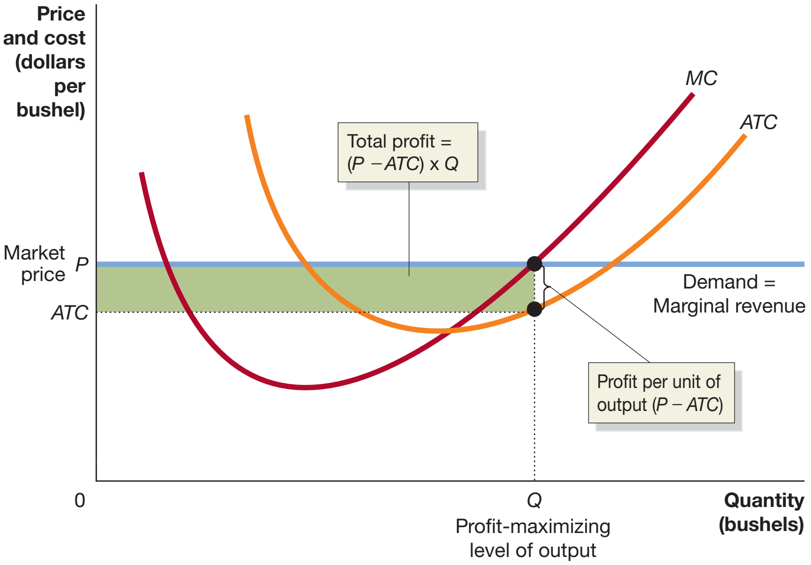
Showing Profit on a Graph

Figure 12.4 shows a firm's average total cost and its marginal cost, which have the shapes that we discussed in Chapter 11, Section 11.4. This figure also shows the firm's marginal revenue curve (which is the same as its demand curve) and the area representing total profit. Using the relationship between profit and average total cost that we just determined, we can say that the area representing total profit has a height equal to $(P - ATC)$ and a base equal to Q. This area is shown by the green-shaded rectangle.

Figure 12.4

The Area of Maximum Profit

A firm maximizes profit at the level of output at which marginal revenue equals marginal cost. The difference between price and average total cost equals profit per unit of output. Total profit equals profit per unit multiplied by the number of units produced. Total profit is represented by the area of the green-shaded rectangle, which has a height equal to ($P - ATC$) and a width equal to Q.



Solved Problem 12.3

Determining Profit-Maximizing Price and Quantity

Suppose that Andy sells basketballs in the perfectly competitive basketball market. His output per day and his costs are as follows:

Output per Day	Total Cost
0	$10.00
1	20.50
2	24.50
3	28.00
4	34.00
5	43.00
6	55.50
7	72.00
8	93.00
9	119.00

a. Suppose the current equilibrium price in the basketball market is $12.50. To maximize profit, how many basketballs will Andy produce, what price will he charge, and how much profit (or loss) will he earn? Draw a graph to illustrate your answer. Label your graph clearly and include (1) Andy's demand, *ATC*, *AVC*, *MC*, and *MR* curves; (2) the price he is charging; (3) the quantity he is producing; and (4) the area representing his profit (or loss).

b. Suppose the equilibrium price of basketballs falls to $6.00. Now how many basketballs will Andy produce, what price will he charge, and how much profit (or loss) will he make? Draw a graph to illustrate this situation, using the instructions in part (a).

Solving the Problem

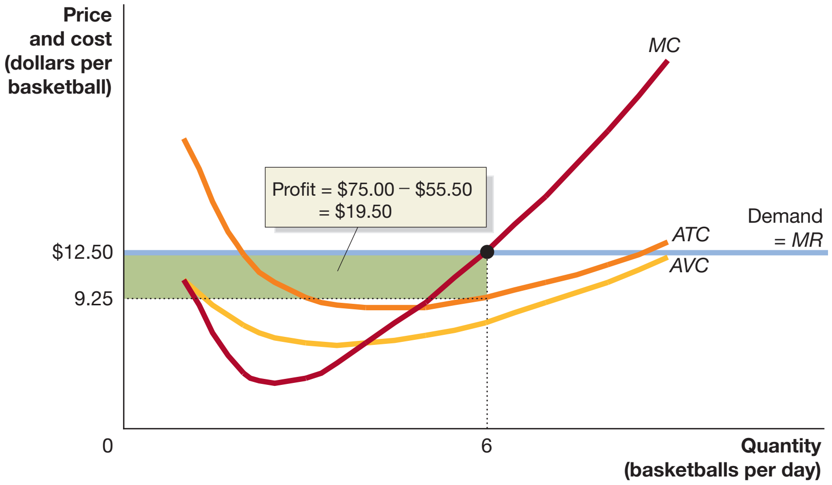
Step 1: **Review the chapter material.** This problem is about using cost curve graphs to analyze perfectly competitive firms, so you may want to review the section "Illustrating Profit or Loss on the Cost Curve Graph."

Step 2: **Calculate Andy's marginal cost, average total cost, and average variable cost.** To maximize profit, Andy will produce the quantity of output where marginal revenue is equal to marginal cost. We can calculate marginal cost, average total cost, and average variable cost from the information given in the following table. Average total cost (*ATC*) equals total cost (*TC*) divided by the quantity of output (*Q*). Average variable cost (*AVC*) equals variable cost (*VC*) divided by output (*Q*). To calculate variable cost, recall that total cost equals variable cost plus fixed cost. When output equals zero, total cost equals fixed cost. In this case, fixed cost equals $10.00.

Output per Day (*Q*)	Total Cost (*TC*)	Fixed Cost (*FC*)	Variable Cost (*VC*)	Average Total Cost (*ATC*)	Average Variable Cost (*AVC*)	Marginal Cost (*MC*)
0	$10.00	$10.00	$0.00	—	—	—
1	20.50	10.00	10.50	$20.50	$10.50	$10.50
2	24.50	10.00	14.50	12.25	7.25	4.00
3	28.00	10.00	18.00	9.33	6.00	3.50
4	34.00	10.00	24.00	8.50	6.00	6.00
5	43.00	10.00	33.00	8.60	6.60	9.00
6	55.50	10.00	45.50	9.25	7.58	12.50
7	72.00	10.00	62.00	10.29	8.86	16.50
8	93.00	10.00	83.00	11.63	10.38	21.00
9	119.00	10.00	109.00	13.22	12.11	26.00

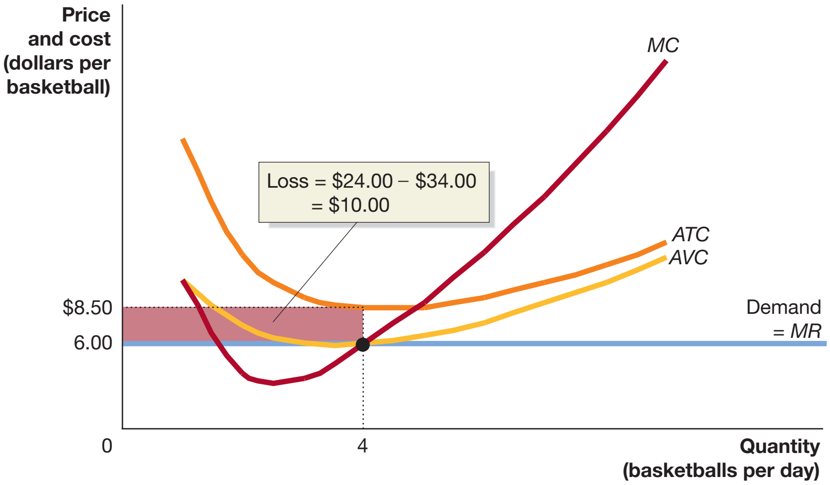
Step 3: Use the information from the table in step 2 to calculate how many basketballs Andy will produce, what price he will charge, and how much profit he will earn if the market price of basketballs is $12.50. Andy's marginal revenue is equal to the market price of $12.50. Marginal revenue equals marginal cost when Andy produces 6 basketballs per day. So, Andy will produce 6 basketballs per day and charge a price of $12.50 per basketball. Andy's profit is equal to his total revenue minus his total costs. His total revenue equals the 6 basketballs he sells multiplied by the $12.50 price, or $75.00. So, his profit equals $75.00 − $55.50 = $19.50.

Step 4: Use the information from the table in step 2 to illustrate your answer to part (a) with a graph. Your graph should look like this one.



Step 5: Calculate how many basketballs Andy will produce, what price he will charge, and how much profit he will earn when the market price of basketballs is $6.00. Referring to the table in step 2, we can see that marginal revenue equals marginal cost when Andy produces 4 basketballs per day. He charges the market price of $6.00 per basketball. His total revenue is only $24.00, while his total costs are $34.00, so he will have a loss of $10.00. (Can we be sure that Andy will continue to produce even though he is operating at a loss? We answer this question in Section 12.4.)

Step 6: Illustrate your answer to part (b) with a graph. Your graph should look like this one.



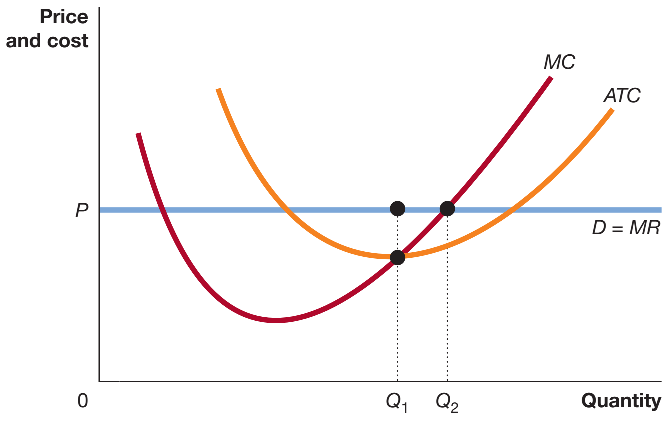
Your Turn: For more practice, do related problems 3.3 and 3.4 at the end of this chapter.

Don't Let This Happen to You

Remember That Firms Maximize Their Total Profit, *Not* Their Profit per Unit

A student examines the following graph and argues: "I think that a firm will want to produce at Q_1, not Q_2. At Q_1, the distance between price and average total cost is the greatest. So at Q_1, the firm will be maximizing its profit per unit." You might be tempted to agree with the student's argument.

The student's argument is incorrect, however, because firms are interested in maximizing their *total* profit, not their profit per unit. We know that profit is not maximized at Q_1 because at that level of output, marginal revenue is greater than marginal cost. A firm can always increase its profit by producing any unit that adds more to its revenue than it does to its costs. Only when the firm has expanded production to Q_2 will it have produced every unit for which marginal revenue is greater than marginal cost. At that quantity of output, it will have maximized profit.



Your Turn: Test your understanding by doing related problem 3.5 at the end of this chapter.

Illustrating When a Firm Is Breaking Even or Operating at a Loss

We have already seen that to maximize profit, a firm produces the quantity of output where marginal revenue equals marginal cost. But will the firm actually make a profit producing that quantity? The answer depends on the relationship of price to average total cost at that quantity. There are three possibilities:

1. $P > ATC$, which means the firm makes a profit
2. $P = ATC$, which means the firm *breaks even* (that is, its total cost equals its total revenue)
3. $P < ATC$, which means the firm experiences a loss

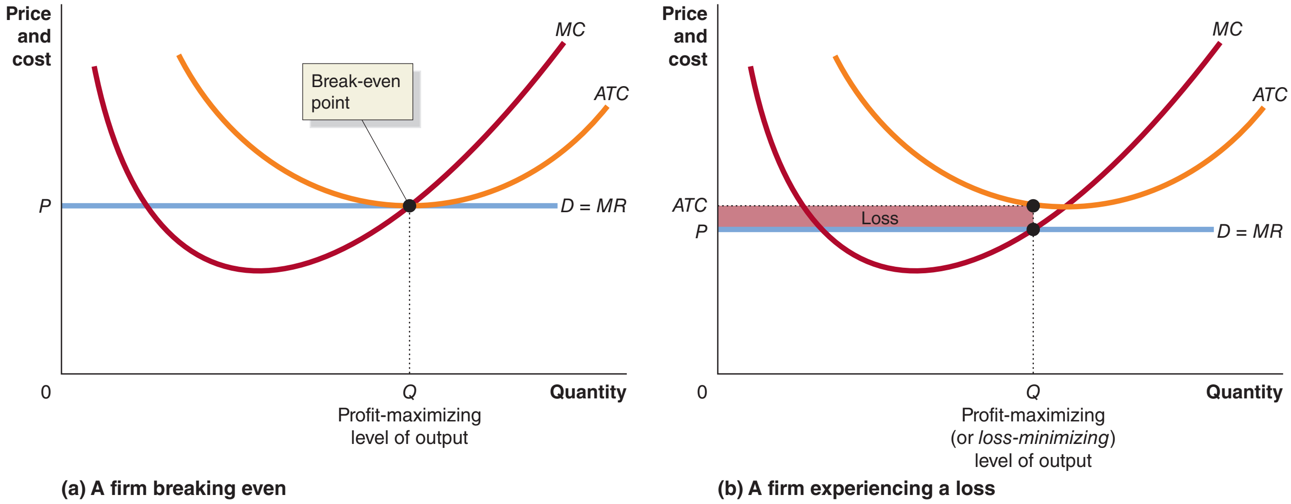


Figure 12.5 **A Firm Breaking Even and a Firm Experiencing a Loss**

In panel (a), price equals average total cost, and the firm breaks even because its total revenue will be equal to its total cost. In this situation, the firm makes zero economic profit.

In panel (b), price is below average total cost, and the firm experiences a loss. The loss is represented by the area of the red-shaded rectangle, which has a height equal to $(ATC - P)$ and a width equal to Q.

Figure 12.4 shows the first possibility, where the firm makes a profit. Figure 12.5 shows the situations where a firm breaks even or suffers a loss. In panel (a) of Figure 12.5, at the quantity of output at which $MR = MC$, price is equal to average total cost. Therefore, total revenue is equal to total cost, and the firm will break even, making zero economic profit. In panel (b), at the quantity of output at which $MR = MC$, price is less than average total cost. Therefore, total revenue is less than total cost, and the firm suffers a loss. In this case, maximizing profit amounts to *minimizing* loss.

12.4 Deciding Whether to Produce or to Shut Down in the Short Run

LEARNING OBJECTIVE: Explain why firms may shut down temporarily.

In panel (b) of Figure 12.5, we assumed that the firm would continue to produce even though it was operating at a loss. In the short run, a firm experiencing a loss has two choices:

1. Continue to produce
2. Stop production by shutting down temporarily

In many cases, a firm experiencing a loss will consider stopping production temporarily. Even during a temporary shutdown, however, a firm must still pay its fixed costs. For example, if the firm has signed a lease for its building, the landlord will expect to receive a monthly rent payment, even if the firm is not producing anything that month. Therefore, if a firm does not produce, it will suffer a loss equal to its fixed costs. This loss is the maximum the firm will accept as a result of producing. The firm will shut down if producing would cause it to lose an amount greater than its fixed costs.

A firm can reduce its loss below the amount of its total fixed costs by continuing to produce, provided that the total revenue it receives is greater than its variable cost. A firm can use the revenue over and above the amount of its variable cost to cover part of its fixed costs. In this case, a firm will have a smaller loss if it continues to produce than if it shuts down.

Sunk cost A cost that has already been paid and cannot be recovered.

In analyzing a firm's decision to shut down, we are assuming that its fixed costs are **sunk costs**, which are costs that a firm has already paid and cannot recover. So, the firm cannot recover its fixed costs by shutting down. For example, if a farmer has taken out a loan to buy land, the farmer is legally required to make the monthly loan payment whether he grows any wheat that season or not. The farmer has to spend those funds and cannot get them back, *so the farmer should treat his sunk costs as irrelevant to his short-run decision making*. For any firm, whether total revenue is greater or less than *variable cost* is the key to deciding whether to shut down or to continue producing in the short run. As long as a firm's total revenue is greater than its variable cost, it should continue to produce no matter how large or small its fixed costs.

One option *not* available to a firm with losses in a perfectly competitive market is to raise its price. If the firm did raise its price, it would lose all its customers, and its sales would drop to zero. For example, during the past 20 years, the price of wheat has typically been high enough for a typical wheat farmer in the United States to at least break even. For instance, in 2023, partly due to the decline in the supply of Ukrainian wheat on the world market following the Russian invasion, the price of wheat reached the particularly high price of $9 per bushel. At that price, most wheat farmers in the United States were able to earn a profit. In contrast, the price of wheat in 2017 was only $4 per bushel, which was below the break-even point for some farmers. Any wheat farmer in 2017 who tried to raise the price of his or her wheat to $9 per bushel would have seen sales quickly disappear because buyers could purchase all the wheat they wanted at $4 per bushel from the thousands of other wheat farmers.

The Supply Curve of a Firm in the Short Run

Remember that the supply curve for a firm tells us how many units of a product the firm is willing to sell at any given price. Notice that the marginal cost curve for a firm in a perfectly competitive market tells us the same thing. The firm will produce the quantity of output where $MR = MC$. Because price equals marginal revenue for a firm in a perfectly competitive market, the firm will produce the quantity where $P = MC$. For any given price, we can determine from the marginal cost curve the quantity of output the firm will supply. *Therefore, a perfectly competitive firm's marginal cost curve is also its supply curve*. But there's an important qualification to this fact. We have seen that if a firm is experiencing a loss, it will shut down if its total revenue is less than its variable cost:

$$\text{Total revenue} < \text{Variable cost},$$

or, in symbols:

$$(P \times Q) < VC.$$

If we divide both sides by Q, we have the result that the firm will shut down if:

$$P < AVC.$$

If the price drops below average variable cost, the firm will have a smaller loss if it shuts down and produces no output. *So, the firm's marginal cost curve is its supply curve only for prices at or above average variable cost.*

Shutdown point The minimum point on a firm's average variable cost curve; if the price falls below this point, the firm shuts down production in the short run.

Recall that the marginal cost curve intersects the average variable cost at the quantity where the average variable cost curve is at its minimum point. Therefore, as shown in Figure 12.6, the firm's supply curve is its marginal cost curve above the minimum point of the average variable cost curve. For prices below minimum average variable cost (P_{MIN}), the firm will shut down, and its output will drop to zero. The minimum point on a firm's average variable cost curve is called the **shutdown point**, and it occurs at the output level Q_{SD}. The dark red line in Figure 12.6 shows the supply curve for the firm in the short run.

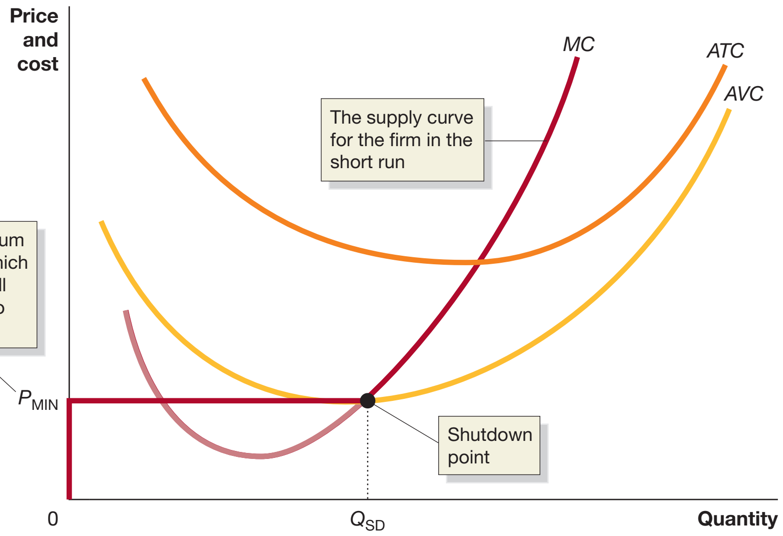


Figure 12.6

The Firm's Short-Run Supply Curve

Because price equals marginal revenue for a firm in a perfectly competitive market, the firm will produce the quantity at which $P = MC$. For any given price, we can determine the quantity of output the firm will supply from the marginal cost curve, so the marginal cost curve is the firm's supply curve. But the firm will shut down if the price falls below average variable cost. At the quantity Q_{SD}, the marginal cost curve crosses the average variable cost curve at the firm's shutdown point. For prices below P_{MIN}, the supply curve is a vertical line along the price axis, which shows that the firm will supply zero output at those prices. The red line is the firm's short-run supply curve.

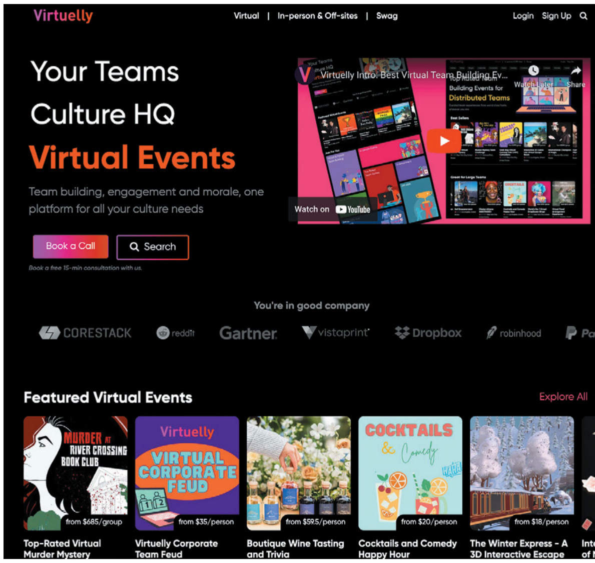
Apply the Concept

What Does "Break Even" Mean for an AI Entrepreneur?

We've just seen that a firm is breaking even when the price the firm receives is high enough for its revenue to cover all of its costs, including the opportunity cost of the owner's investment in the firm and the opportunity cost of the services the owner provides the firm. But some news articles use a different definition of the term *break even*. Ankit Dhawan left the artificial intelligence unit of Amazon Web Services in 2020, during the Covid–19 pandemic, to start Virtuelly Inc., a small firm that "offers interactive events designed to foster team building." An article in the *Wall Street Journal* states that in the previous year, Virtuelly had $1 million in revenue and was close to breaking even. But the article also states that Dhawan had sold some of his Amazon stock to invest in his company and was paying himself "a monthly salary of $4,000, a fraction of his Amazon earnings." To break even, Dhawan's firm has to cover all of its costs, including the opportunity cost of the funds he has invested in the firm and the opportunity cost of the services he supplies the firm as its owner.

Therefore, to break even, his firm has to earn revenue equal to the firm's variable cost plus the return he would have earned on the Amazon stock he sold and the salary he was earning from Amazon—not just the $4,000 per month salary he was paying himself. Although the article doesn't state this directly, it is likely that when Dhawan described his firm as being close to breaking even, he was counting only his *explicit costs* and not including the *implicit costs* of the full value of the services he was providing his firm—as represented by the salary he was forgoing by no longer working for Amazon—or the return he would have been receiving on his Amazon stock if he hadn't sold it to finance his firm. In an economic sense, then, Dhawan's firm was incurring a loss. As we discussed in Chapter 8, Section 8.3, *accounting costs* are primarily explicit costs and do not include the implicit costs we just discussed, so Dhawan may be close to breaking even in an accounting sense.

Dhawan might still be willing to operate his firm, however, if the value he places on being an entrepreneur is greater than the value of his forgone salary and forgone investment return. There are two main reasons that entrepreneurs may prefer running their own businesses, even if they are incurring economic losses: (1) Some people have a strong preference for choosing what work they want to do rather than having to follow the directions of a manager, as they would as an employee of a corporation.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Virtual | In-person & Off-sites | Swag
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Your Teams
Culture HQ
Virtual Events
Virtuelly Intro: Best Virtual Team Building Ev...
Watch Later
Share
Watch on YouTube
Book a Call
Search
You're in good company
CORESTACK
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Gartner
vistaprint
Dropbox
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Featured Virtual Events
Explore All
MURDER AT RIVER CROSSING BOOK CLUB
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When Ankit Dhawan left Amazon in 2020 to start Virtuelly Inc., he faced both explicit costs and implicit costs.

An entrepreneur who makes this choice is not maximizing profit but may be maximizing utility. (2) Some entrepreneurs may recognize that their firms are incurring an economic loss in the present (even if breaking even in an accounting sense) but may expect that their firms will experience rapid growth and eventually earn a substantial economic profit. As the owner of the firm, the entrepreneur will receive all of that economic profit. As an employee of another firm receiving a fixed salary, the entrepreneur would not directly benefit from increases in the firm's profit.

Your Turn: Test your understanding by doing related problem 4.8 at the end of this chapter.

Solved Problem 12.4

When to Shut Down a Farm

According to an article in the *Wall Street Journal*, during a period of low wheat prices, a farmer decided to take 170 acres out of production and plant grass on it rather than wheat because "that seemed like his only choice after spending about $6.50 a bushel on seed, fertilizer, fuel, and pesticides to grow wheat last year only to [sell the wheat for] . . . $2.90 a bushel."

a. Are the costs listed in the article variable costs or fixed costs? Briefly explain.

b. Can we calculate the farmer's loss per bushel of wheat from the information given? Briefly explain.

c. Provide an economic explanation for the farmer's decision to take these acres out of production. Illustrate your answer with a graph.

Solving the Problem

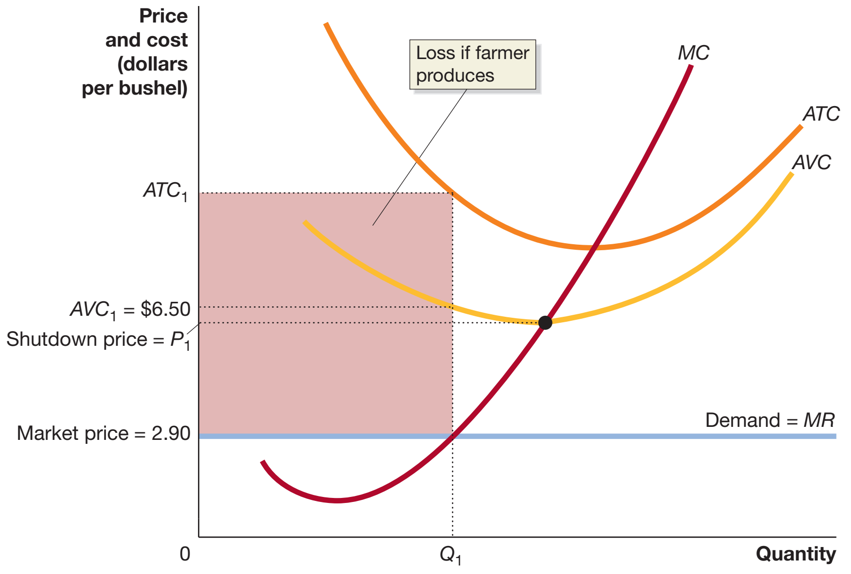
Step 1: **Review the chapter material.** This problem is about firms deciding whether to produce when price is below average total cost, so you may want to review the section "Deciding Whether to Produce or to Shut Down in the Short Run."

Step 2: **Answer part (a) by explaining whether the listed costs are variable costs or fixed costs.** The more wheat the farmer grows, the more seed, fertilizer, fuel, and pesticides he needs to use. Because the costs of these inputs change as output changes, we can conclude that they are variable costs rather than fixed costs.

Step 3: **Answer part (b) by explaining whether we have enough information to calculate the farmer's loss per bushel of wheat.** His loss per bushel is equal to $P - ATC$. Recall that $ATC = AVC + AFC$. We are given information on the farmer's average variable cost but not on his average fixed cost. Therefore, we don't have enough information to determine his loss per bushel.

Step 4: **Answer part (c) by providing an economic explanation for the farmer's decision to take the acres out of production.** We've seen that a firm will shut down if $P < AVC$. In that case, a firm will suffer a smaller loss by shutting down than by continuing to produce. We know that the farmer's average variable cost of growing wheat on these acres is $6.50, while the price of wheat is only $2.90. Therefore, the farmer will reduce his loss if he shuts down.

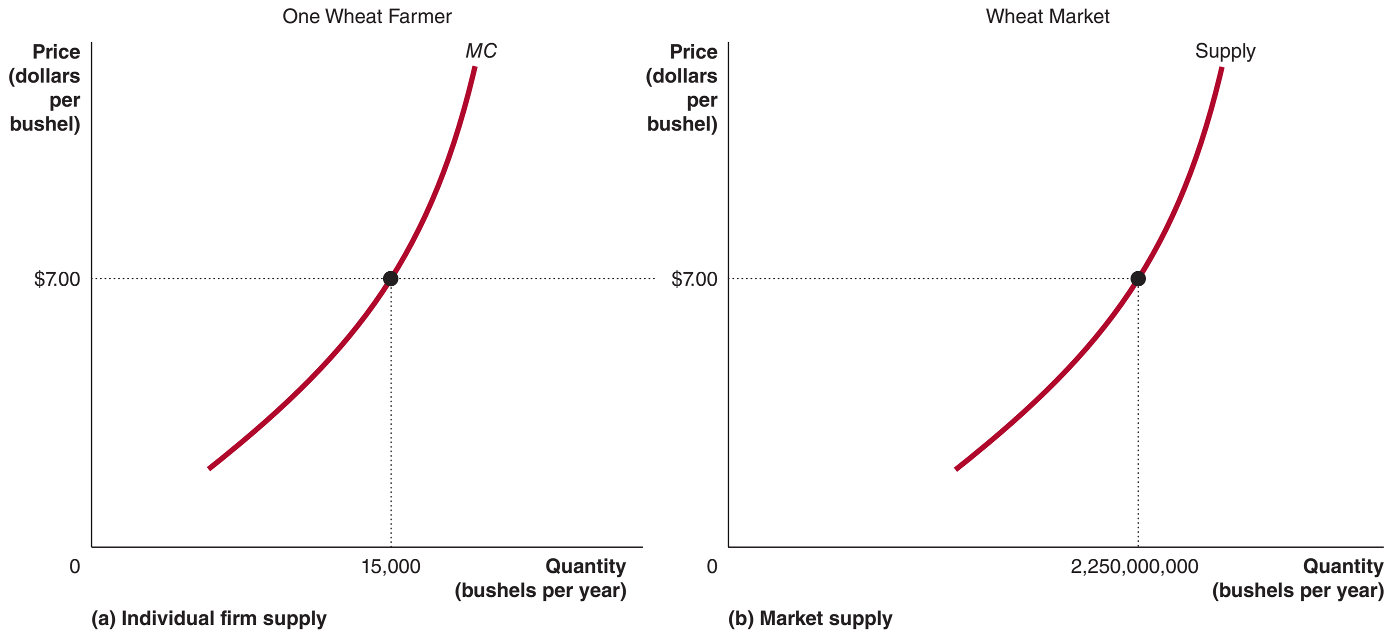
Step 5: **Finish answering the problem by drawing a graph to illustrate your answer from step 4.** Your graph should look like this one. Note that at the profit-maximizing (in this case, loss-minimizing) level of output, Q_1, the market price of $2.90 per bushel is below the farmer's average variable cost of $6.50. The farmer would need the price of wheat to be P_1 in order to continue producing in the short run. If he were to produce at a price of $2.90, his loss would equal the area of the red-shaded rectangle. We know that this amount is greater than the loss he would suffer by shutting down because the market price is below his average variable cost.



Your Turn: Test your understanding by doing related problems 4.9, 4.10, and 4.11 at the end of this chapter.

The Market Supply Curve in a Perfectly Competitive Industry

The market demand curve is determined by adding up the quantity demanded by each consumer in the market at each price (see Chapter 10, Section 10.2). Similarly, the market supply curve is determined by adding up the quantity supplied by each firm in the market at each price. Each firm's marginal cost curve tells us how much that firm will supply at each price. So, the market supply curve can be derived directly from the marginal cost curves of the firms in the market. Panel (a) of Figure 12.7 shows the marginal cost curve



(a) Individual firm supply

(b) Market supply

Figure 12.7 **Firm Supply and Market Supply**

We can derive the market supply curve by adding up the quantity that each firm in the market is willing to supply at each price. In panel (a), one wheat farmer is willing to supply 15,000 bushels of wheat at a price of $7 per bushel. If every wheat farmer supplies the same amount of wheat at this price and if there are 150,000 wheat farmers, the total amount of wheat supplied at a price of $7 will equal 15,000 bushels per farmer × 150,000 farmers = 2.25 billion bushels of wheat. This amount is one point on the market supply curve for wheat shown in panel (b). We can find the other points on the market supply curve by determining how much wheat each farmer is willing to supply at each price.

for one wheat farmer. At a price of $7, this wheat farmer supplies 15,000 bushels of wheat. If every wheat farmer supplies the same amount of wheat at this price and if there are 150,000 wheat farmers, the total quantity of wheat supplied at a price of $7 will be:

$$15{,}000 \text{ bushels per farmer} \times 150{,}000 \text{ farms} = 2.25 \text{ billion bushels of wheat.}$$

Panel (b) shows a price of $7 and a quantity of 2.25 billion bushels as a point on the market supply curve for wheat. In reality, of course, not all wheat farms are alike. Some wheat farms supply more at the market price than the typical farm; other wheat farms supply less. The key point is that we can derive the market supply curve by adding up the quantity that each firm in the market is willing and able to supply at each price.

12.5

"If Everyone Can Do It, You Can't Make Money at It": The Entry and Exit of Firms in the Long Run

LEARNING OBJECTIVE: Explain how entry and exit ensure that perfectly competitive firms earn zero economic profit in the long run.

In the long run, unless a firm can cover all its costs, it will shut down and exit the industry. In a market system, firms continually enter and exit industries. In this section, we will see how profits and losses provide signals to firms that lead to entry and exit.

Economic Profit and the Entry or Exit Decision

Let's look more closely at how economists characterize the profit earned by the owners of a firm. Suppose Sacha Gillette decides to start her own business. After considering her skills and interests and preparing a business plan, she decides to start a cage-free egg farm rather than a restaurant or clothing boutique. After 10 years of effort, Sacha has saved $50,000, and she is able to borrow another $700,000 from a bank. With these funds, she buys the land, equipment, and chickens necessary to start her farm. She intends to sell the eggs in a local farmers' market. When someone invests her own funds in her firm, the opportunity cost to the firm is the return the funds would have earned in their best alternative use (see Chapter 11, Section 11.2). If Farmer Gillette could have earned a 10 percent return on her $50,000 in savings in the best alternative use—which might have been, for example, as a down payment on a small restaurant—then her egg business incurs a $5,000 opportunity cost. We can also think of this $5,000 as being the minimum amount that Farmer Gillette needs to earn on her $50,000 investment in her farm to remain in the industry in the long run.

Table 12.4 lists Farmer Gillette's costs. In addition to her explicit costs, we assume that she has two implicit costs: the $5,000 that represents the opportunity cost of the funds she invested in her farm and the $30,000 salary she could have earned managing someone else's farm instead of her own. Her total costs are $90,000. If the market price

Table 12.4

Farmer Gillette's Costs per Year

Explicit Costs	
Water	$10,000
Wages	18,000
Fertilizer	12,000
Electricity	5,000
Payment on bank loan	10,000
Implicit Costs	
Forgone salary	30,000
Opportunity cost of the $50,000 she has invested in her farm	5,000
Total cost	**$90,000**

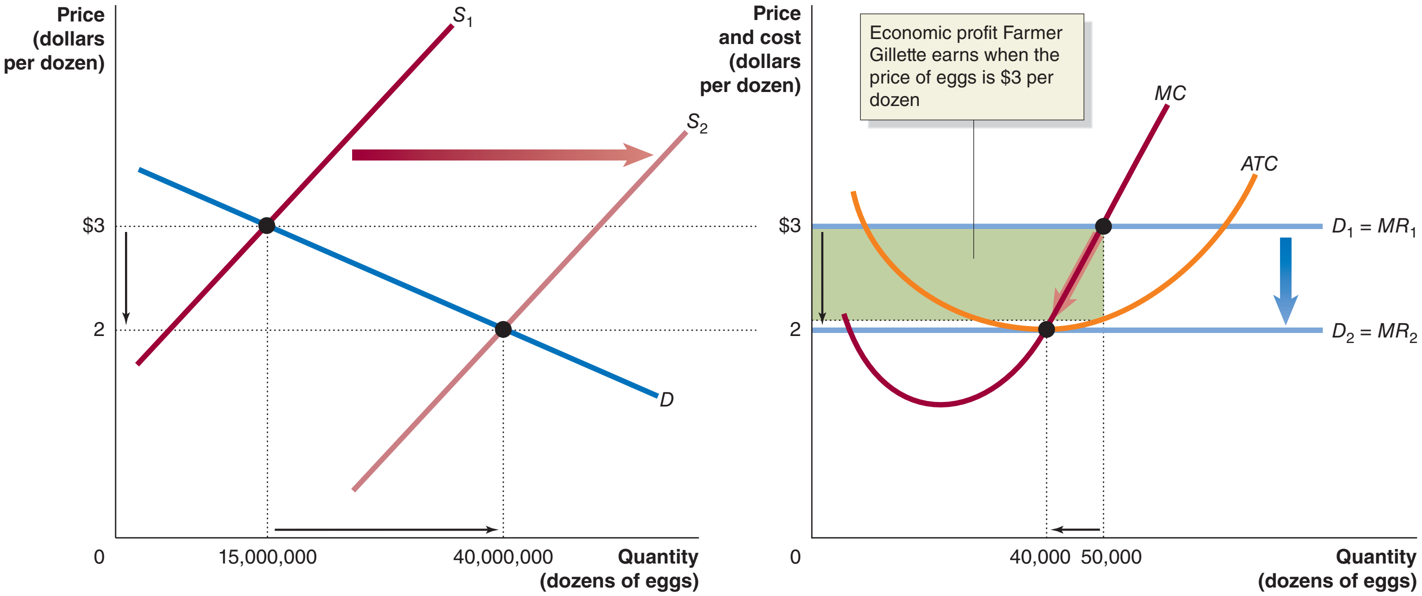
of cage-free eggs is \$3 per dozen and Farmer Gillette sells 50,000 dozen, her total revenue will be \$150,000, and her economic profit will be \$60,000 (total revenue of \$150,000 minus total costs of \$90,000). Recall that **economic profit** equals a firm's revenues minus all its costs, implicit and explicit.

Economic profit A firm's revenues minus all of its implicit and explicit costs.

Economic Profit Leads to Entry of New Firms Unfortunately, Farmer Gillette is unlikely to earn an economic profit for very long. Suppose other farmers are just breaking even by selling regular eggs. In that case, they will have an incentive to switch to selling cage-free eggs so they can begin earning an economic profit. As we saw in the chapter opener, in recent years more farmers have been switching from producing eggs using conventional methods to using cage-free methods, in the hope of earning a higher profit. Remember that the more firms there are in an industry, the farther to the right the market supply curve is. Panel (a) of Figure 12.8 shows that as more farmers begin selling cage-free eggs, the market supply curve shifts to the right. Farmers will continue entering the market until the market supply curve has shifted from S_1 to S_2.

With the supply curve at S_2, the market price will fall to \$2 per dozen. Panel (b) shows the effect on Farmer Gillette, whom we assume has the same costs as other egg farmers. As the market price falls from \$3 to \$2 per dozen, Farmer Gillette's demand curve shifts down, from D_1 to D_2. In the new equilibrium, Farmer Gillette is selling 40,000 dozen eggs, at a price of \$2 per dozen. She and the other egg farmers are no longer earning any economic profit. They are just breaking even, and the return on their investment is just covering the opportunity cost of these funds. New farmers will stop entering the market because the rate of return from selling cage-free eggs is now no better than they can earn by selling regular eggs.

Will Farmer Gillette continue to sell cage-free eggs even though she is just breaking even? She will because the return she is earning on her investment is as high as she could earn elsewhere. It may seem strange that new firms will continue to enter



(a) Market for cage-free eggs sold in farmer's markets

(b) Farmer Gillette's farm

Figure 12.8 **The Effect of Entry on Economic Profit**

Initially, Farmer Gillette and other farmers selling cage-free eggs are able to charge \$3 per dozen and earn an economic profit. Farmer Gillette's economic profit is represented by the area of the green-shaded rectangle in panel (b). Panel (a) shows that as other farmers begin to sell cage-free eggs, the market supply curve shifts to the right, from S_1 to S_2, and the market price drops to \$2 per dozen. Panel (b) shows that the falling price causes Farmer Gillette's demand curve to shift down from D_1 to D_2, and she reduces her output from 50,000 dozen eggs to 40,000. At the new market price of \$2 per dozen, cage-free egg farmers are just breaking even: Their total revenue is equal to their total cost, and their economic profit is zero. Notice the difference in scale between the graphs in panels (a) and (b).

a market until all economic profit is eliminated and that established firms remain in a market despite not earning any economic profit. But it seems strange only because we are used to thinking in terms of accounting profit rather than *economic* profit. Remember that accounting rules generally require that only explicit costs be included on a firm's financial statements. The opportunity cost of the funds Farmer Gillette invested in her farm—$5,000—and her forgone salary—$30,000—are economic costs, but neither of these costs is an accounting cost. So, although an accountant would see Farmer Gillette as earning a profit of $35,000, an economist would see her as just breaking even. Farmer Gillette must pay attention to her accounting profit when preparing her financial statements and when paying her income tax. But because economic profit takes into account all her costs, it more accurately indicates the financial health of her farm.

Apply the Concept

It's Tough to Earn a Profit Reselling Sneakers

Foot Locker
CommonwealthBank
Town Hall

Richard Milnes/Alamy Stock Photo

Sneakerheads waiting in line to buy limited-edition Nike and Adidas sneakers.

Buying athletic shoes and reselling them for a higher price has become a popular way for some people to make money. The mostly young entrepreneurs involved in this business are often called *sneakerheads*. The total value of sneakers being resold may be as high as $6 billion per year. Analysts at one investment bank forecast that the total would reach $30 billion per year by 2030.

Why would anybody buy sneakers from a sneakerhead that they could buy at a lower price online or from a retail store? Most people wouldn't, which is why most sneakerheads resell only shoes that shoe manufacturers like Nike or Adidas produce in limited quantities—typically fewer than 50,000 pairs. To obtain the shoes, shoe resellers use two main strategies: (1) waiting in line at retail stores on the day that a new limited-quantity shoe will be introduced or (2) buying shoes online using a software application called a bot. A bot speeds up a buyer's checkout process for an online sale. Typical customers buying at an online shoe site take a few minutes to choose a size, fill in their address, and provide their credit card information. But a few minutes is enough time for shoe resellers using bots to buy all of the newly released shoes available on the site.

In addition to reselling shoes on their own sites, many sneakerheads use dedicated resale sites like StockX and GOAT. These sites have greatly increased the liquidity of sneakers, or the ease with which sneakers can be resold. In effect, limited-edition sneakers have become an asset like stocks, bonds, or gold because they can be bought and sold in the secondary market that exists on the online resale sites. (We discuss the concepts of primary and secondary markets for assets in Chapter 8, Section 8.2.)

An article in the *New York Times* gives an example of the problems that bots can cause for retail shoe stores. Bodega, a shoe store in Boston, offered the limited-edition New Balance 997S sneaker on its online site. Ten minutes later, the shoe was sold out. One of the store's owners was quoted as saying: "We got destroyed by bots. It was making it impossible for our average customers to even have a shot at the shoes." Although the store had a policy of allowing customers to buy a maximum of three pairs of shoes, shoe resellers were able to get around the policy by having shoes shipped to their friends' addresses or by having a group of people coordinate their purchases. An article on bloomberg.com described how one reseller along with 15 of his friends used bots to buy 600 pairs of a limited-edition Adidas sneaker from an online site on the morning the sneakers were released. Adidas has a rule that each customer can buy only one pair of its limited-edition shoes, but the company has trouble enforcing the rule.

Shopify and other firms have developed software that retailers can use to make it difficult for resellers to use bots on the retailers' sites. But the developers of bot software can modify the bots to get around anti-bot software.

In contrast with owners of retail stores, shoe manufacturers such as Nike, Adidas, and New Balance have a mixed reaction to sneakerheads using bots to scoop up most pairs of limited-edition shoes shortly after the shoes are released. Like the owners of retail stores, the shoe manufacturers know that they risk upsetting the typical customer if the customer can only buy hot new shoe releases from resellers at prices well above the original retail price. But an active resale market increases the demand for shoes, just as individual investors increased their demand for individual stocks when it became possible to easily buy and sell stocks online using sites like Charles Schwab, E*Trade, and Fidelity. So, manufacturers benefit from knowing that most of their limited-edition shoes will sell out. One industry analyst singled out "the durability of Nike's . . . ability to fuel the sneaker resale ecosystem" as a particular strength of the company. In addition, manufacturers may believe that the publicity about limited-edition shoes rapidly selling out may spill over to increased demand for other shoes the manufacturers sell. (In Chapter 10, Section 10.3 we note that some consumers may receive utility from buying goods that are widely seen as popular and fashionable.)

In the long run, is it possible for sneakerheads to make a profit reselling shoes? It seems unlikely. Entering the market to resell sneakers is relatively easy. Anyone can list shoes for sale on a resale site such as StockX. Anyone willing to accept the opportunity cost of lost time can wait in line in front of a retail store on the day a new shoe is released. Similarly, anyone can purchase a bot and use it to scoop up newly released shoes from online sites. We would therefore expect that in the long run, entry into sneaker reselling will compete away any economic profit that sneakerheads were earning.

In fact, by the summer of 2022, prices on reselling sites were falling. In just the month of June, the average price of sneakers listed on StockX declined by 20 percent. Resellers who had stockpiled shoes waiting for prices to increase were instead selling them because they feared that prices would go even lower. And new limited-edition shoes were taking longer to sell out. According to an article in the *Wall Street Journal*, "A pair of Air Jordans released on July 13 [2022] that might have once vanished in minutes took days to sell out from Nike Inc.'s virtual shelves." In a *Wall Street Journal* article, a reseller suggested that prices were falling because of entry: "You don't want prices to go down, but they're going down anyways, just because of how many people are selling in general."

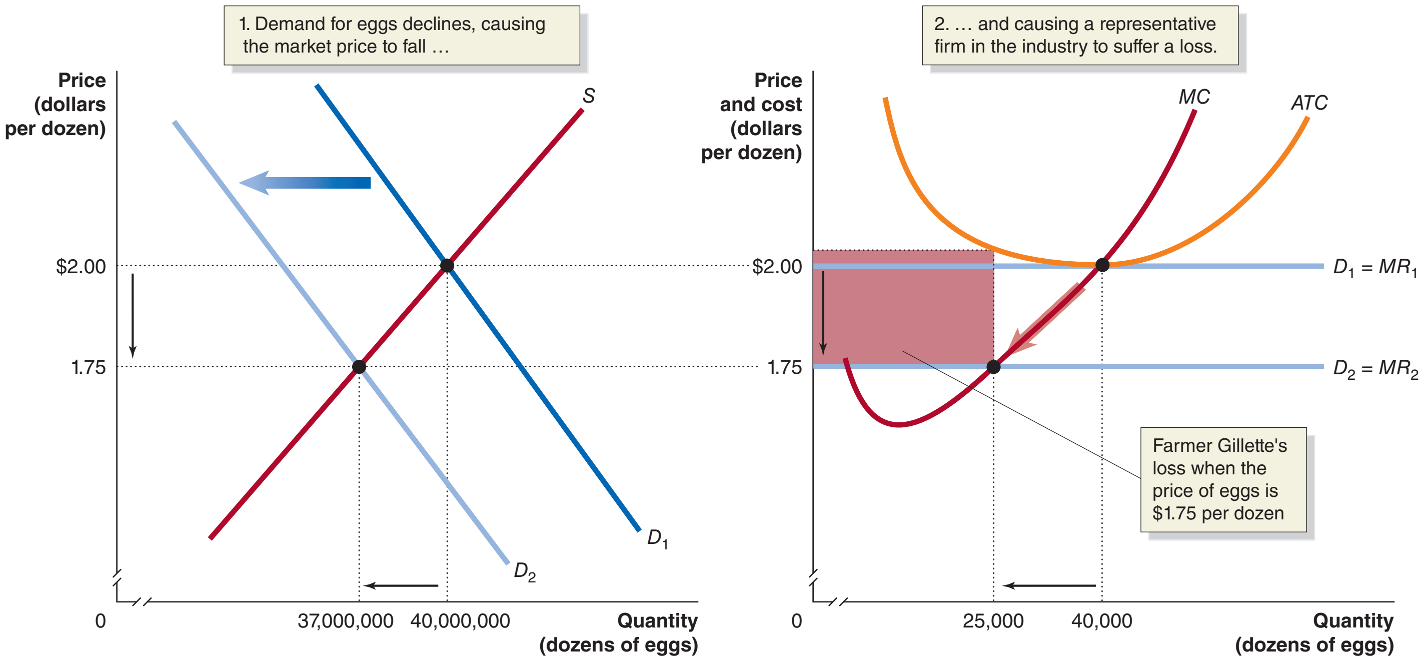
Although a seemingly unusual market, sneaker reselling is subject to the same rules of competition that we see in other markets.

Your Turn: Test your understanding by doing related problem 5.8 at the end of this chapter.

Economic Losses Lead to Exit of Firms Suppose some consumers decide that they no longer want to eat eggs, whether cage free or not. Panel (a) of Figure 12.9 shows that the demand curve for cage-free eggs will shift to the left, from D_1 to D_2, and the market price will fall from \$2 per dozen to \$1.75. Panel (b) shows that as the price falls, a farmer like Sacha Gillette will move down her marginal cost curve to a lower level of output. At the lower level of output and lower price, she will be suffering an **economic loss** because she will not cover all her costs. As long as price is above average variable cost, she will continue to produce in the short run, even when suffering losses. But in the long run, firms will exit an industry if they are unable to cover all their costs. In this case, some farmers will switch from producing eggs to producing other agricultural products or will leave farming.

Economic loss The situation in which a firm's total revenue is less than its total cost, including all implicit costs.

Panel (c) of Figure 12.9 shows that as firms exit from selling cage-free eggs, the market supply curve shifts to the left. Firms will continue to exit, and the supply curve will continue to shift to the left until the price has risen back to \$2 and the market supply curve is at S_2. Panel (d) shows that when the price is back to \$2, the remaining firms in the industry will be breaking even.

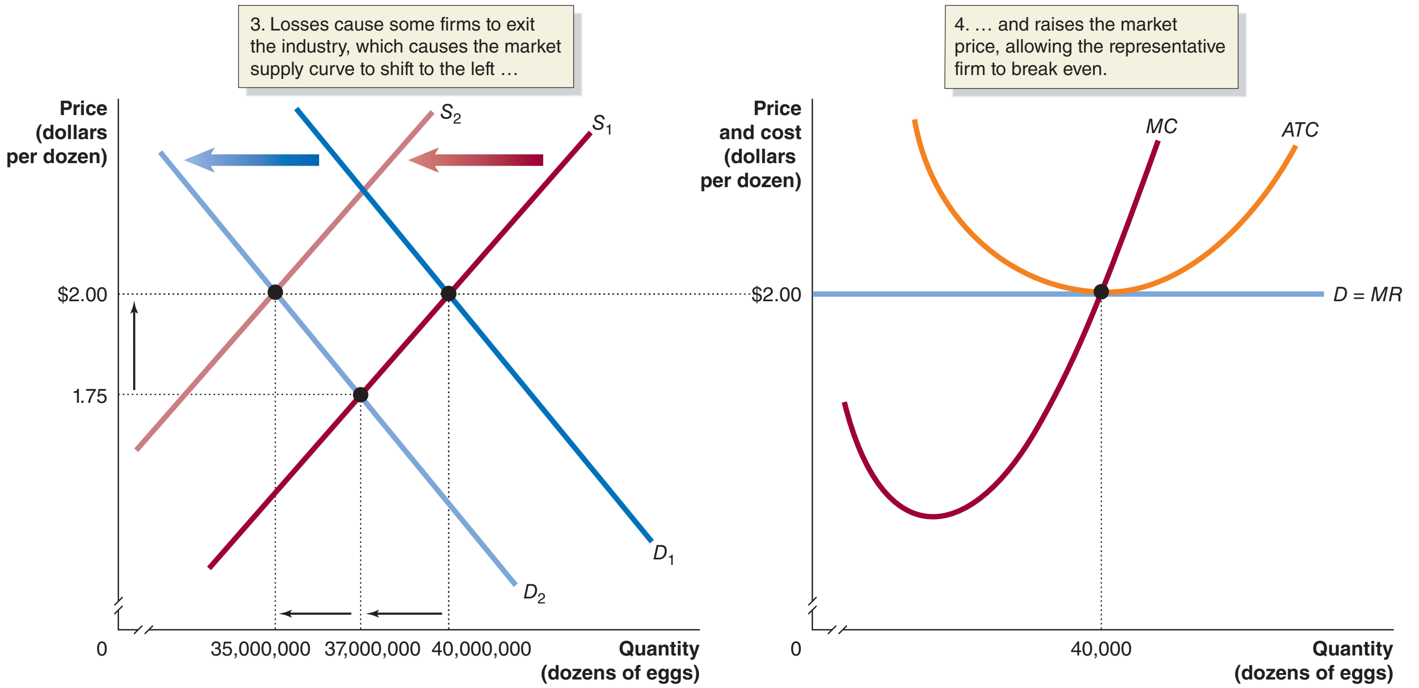

1. Demand for eggs declines, causing the market price to fall …

2. … and causing a representative firm in the industry to suffer a loss.

Farmer Gillette's loss when the price of eggs is $1.75 per dozen

(a) Decrease in the demand for cage-free eggs

(b) Farmer Gillette's loss


3. Losses cause some firms to exit the industry, which causes the market supply curve to shift to the left …

4. … and raises the market price, allowing the representative firm to break even.

(c) Firms exit the market for cage-free eggs

(d) Farmer Gillette breaks even

Figure 12.9 **The Effect of Exit on Economic Losses**

When the price of cage-free eggs is $2 per dozen, Farmer Gillette and other farmers are breaking even. A total quantity of 40,000,000 dozen eggs is sold in the market. Farmer Gillette sells 40,000 dozen. Panel (a) shows a decline in the demand for cage-free eggs from D_1 to D_2 that reduces the market price to $1.75 per dozen. Panel (b) shows that the falling price causes Farmer Gillette's demand curve to shift down from D_1 to D_2 and her output to fall from 40,000 to 25,000 dozen. At a market price of $1.75 per dozen, farmers have losses, represented by the area of the red-shaded rectangle. As a result, some farmers will exit the market, which shifts the market supply curve to the left. Panel (c) shows that exit continues until the supply curve has shifted from S_1 to S_2 and the market price has risen from $1.75 back to $2.00. Panel (d) shows that with the price back at $2.00, Farmer Gillette will break even. In the new market equilibrium in panel (c), total sales of cage-free eggs have fallen from 40,000,000 to 35,000,000 dozen.

Long-Run Equilibrium in a Perfectly Competitive Market

We have seen that economic profits attract firms to enter an industry. The entry of firms forces down the equilibrium market price until a typical firm is breaking even. Economic losses cause firms to exit an industry. The exit of firms forces up the equilibrium market price until the typical firm is breaking even. In **long-run competitive equilibrium**, entry and exit have resulted in the typical firm breaking even. In the long run, firms can also vary their scale by becoming larger or smaller (see Chapter 11, Section 11.6). The *long-run average cost curve* shows the lowest cost at which a firm is able to produce a given quantity of output in the long run. So, we would expect that in the long run, competition drives the market price to the minimum point on the typical firm's long-run average cost curve.

Long-run competitive equilibrium The situation in which the entry and exit of firms has resulted in the typical firm breaking even.

The long run in selling cage-free eggs appears to be several years, which is the amount of time it takes farmers to convert from using traditional methods of producing eggs to using cage-free methods. As we discussed in the chapter opener, the number of farmers producing cage-free eggs has been rapidly increasing, but cage-free eggs are still more profitable than eggs produced using conventional methods. So, we can predict that in the coming years, more farmers will begin producing eggs using cage-free methods.

Firms in perfectly competitive markets are in a constant struggle to stay one step ahead of their competitors. They are always looking for new ways to provide a product, such as selling cage-free eggs. It is possible for firms to find ways to earn an economic profit for a while, but competition typically eliminates that profit in just a few years. This observation is not restricted to agriculture. In any perfectly competitive market, an opportunity to make an economic profit never lasts long. As the late Sharon Oster, an economist at Yale University, put it, "If everyone can do it, you can't make money at it."

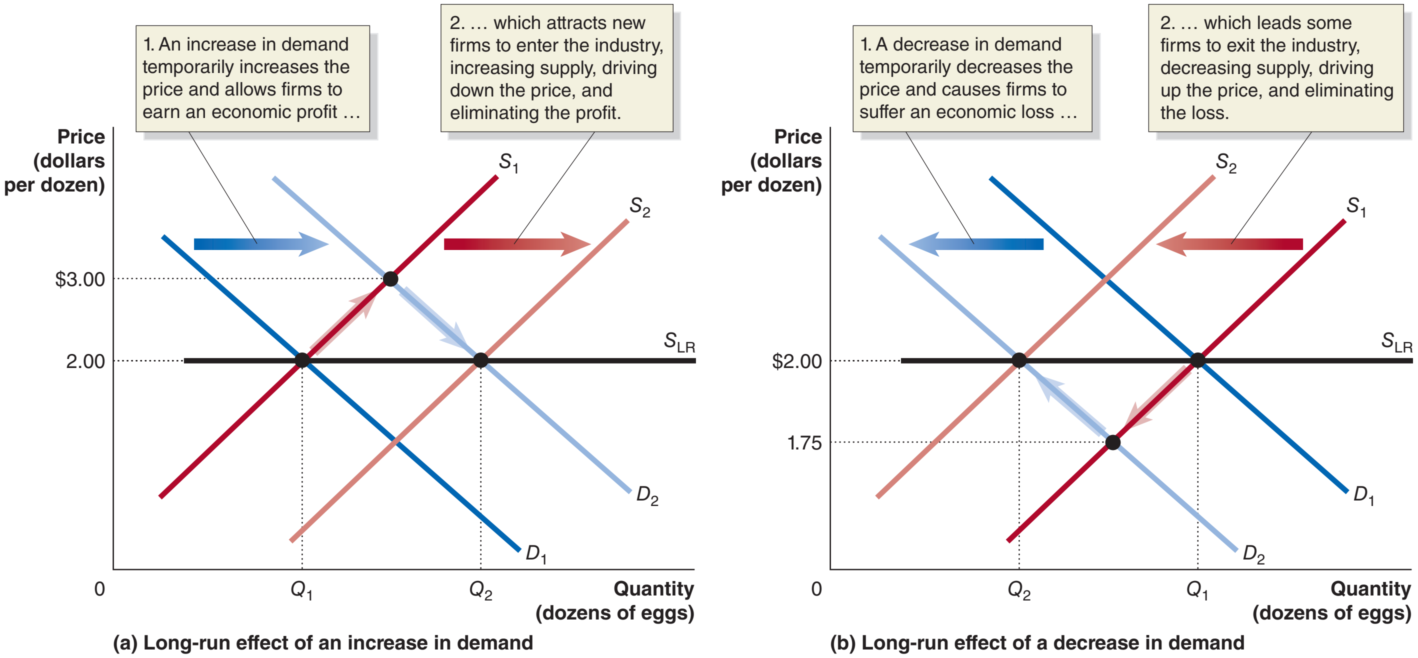
The Long-Run Supply Curve in a Perfectly Competitive Market

If a typical poultry farmer selling cage-free eggs breaks even at a price of $2 per dozen, in the long run, the market price will always return to this level. For example, if Panera Bread, Dunkin', and McDonald's decide to use only cage-free eggs in the food they sell and additional states ban the sale of eggs that aren't cage free, the result will be an increase in demand that causes the market price to rise above $2, and farmers will earn an economic profit. That profit will attract additional farmers into the market, and the market supply curve will shift to the right until the price is back to $2. Panel (a) in Figure 12.10 illustrates the long-run effect of an increase in demand. An increase in demand from D_1 to D_2 causes the market price to rise temporarily from $2 per dozen to $3. At this price, farmers are making an economic profit selling cage-free eggs, but the profit attracts the entry of new farmers. The result is an increase in supply from S_1 to S_2, which forces the price back down to $2 per dozen and eliminates the economic profit.

Similarly, if a decrease in demand causes the market price to fall below $2, farmers will experience an economic loss. The loss will cause some farmers to exit the market, the supply curve will shift to the left, and the price will return to $2. Panel (b) in Figure 12.10 illustrates the long-run effect of a decrease in demand. A decrease in demand from D_1 to D_2 causes the market price to fall temporarily from $2 per dozen to $1.75. At this price, farmers are suffering an economic loss, but the loss causes some farmers to exit the market for selling cage-free eggs. The result is a decrease in supply from S_1 to S_2, which forces the price back up to $2 per dozen and eliminates the loss.

The **long-run supply curve** shows the relationship in the long run between the market price and the quantity supplied. In the long run, the price will be $2 per dozen, no matter how many eggs are produced. So, as Figure 12.10 shows, the long-run supply curve (S_{LR}) is a horizontal line at a price of $2. Remember that the price returns to $2 in the long run because at this price, a typical firm in the industry just breaks even. The typical firm breaks even because $2 is at the minimum point on the firm's average total cost curve. We can draw the important conclusion that *in the long run, a perfectly competitive market will supply whatever amount of a good consumers demand at a price determined by the minimum point on the typical firm's average total cost curve.*

Long-run supply curve A curve that shows the relationship in the long run between the market price and the quantity supplied.



(a) Long-run effect of an increase in demand

(b) Long-run effect of a decrease in demand

Figure 12.10 **The Long-Run Supply Curve in a Perfectly Competitive Industry**

Panel (a) shows that an increase in demand for cage-free eggs will lead to a temporary increase in price from \$2.00 to \$3.00 per dozen, as the market demand curve shifts to the right, from D_1 to D_2. The entry of new firms shifts the market supply curve to the right, from S_1 to S_2, which will cause the price to fall back to its long-run level of \$2.00. Panel (b) shows that a decrease in demand will lead to a temporary decrease in price from \$2.00 to \$1.75 per dozen, as the market demand curve shifts to the left, from D_1 to D_2. The exit of firms shifts the market supply curve to the left, from S_1 to S_2, which causes the price to rise back to its long-run level of \$2.00. The long-run supply curve (S_{LR}) shows the relationship between market price and the quantity supplied in the long run. In this case, the long-run supply curve is a horizontal line.

Because the position of the long-run supply curve is determined by the minimum point on the typical firm's average total cost curve, anything that raises or lowers the costs of the typical firm in the long run will cause the long-run supply curve to shift. For example, if the cost of the feed for chickens permanently increases enough to add \$0.25 per dozen to the average cost of producing cage-free eggs, the long-run supply curve will shift up by \$0.25.

Apply the Concept

The Winding Path to Long-Run Equilibrium in the Egg Market

The process of arriving at long-run equilibrium that we illustrated in Figure 12.10 can stretch out over years because it requires firms to adjust the products they sell in response to changes in consumer tastes. This response may require that firms overhaul their production processes. In fact, as consumer tastes change over time, the market may never quite reach long-run equilibrium. In that sense, it is better to think of the concept of long-run equilibrium as providing a way of analyzing how markets will evolve over time than as describing markets as they are at any particular time.

Take the egg market as an example. As we saw in the chapter opener, poultry farmers in 2015 were able to sell cage-free eggs for a price that more than offset the higher costs of raising cage-free chickens. As a result, farmers received a higher return from investing in selling cage-free eggs than from investing in selling conventional eggs. By 2019, though, most of that higher return had been wiped out by the entry of additional farmers into the cage-free egg market, which caused the prices of those eggs to decline. The movement toward long-run equilibrium was well underway—but then consumer tastes changed again.

Most consumers who prefer cage-free eggs do so because they want chickens to be raised humanely. The U.S. Department of Agriculture (USDA) provides the following definition of cage free:

> Eggs packed in USDA grademarked consumer packages labeled as cage free are laid by hens that are able to roam vertically and horizontally in *indoor houses*, and have access to fresh food and water. Cage-free systems . . . must allow hens to exhibit natural behaviors and include enrichments such as scratch areas, perches and nests.

Colleen Michaels/Shutterstock

In early 2023, farmers were receiving a price of $6.10 per dozen for pasture-raised eggs.

Although chickens have more room to move around when raised cage free, they are not being raised outdoors in the way that some consumers would prefer. To accommodate the tastes of these consumers, some farmers have begun to market their eggs as being "pasture raised." An article on bloomberg.com described this method of producing eggs: "Pastured eggs come from hens that spend most of their time outdoors, dining on bugs and taking dust baths while also indulging in their favorite activities, like scratching and perching."

In early 2023, farmers were receiving a price of $6.10 per dozen for pasture-raised eggs, as compared with $3.39 per dozen for cage-free eggs and $2.25 per dozen for conventional eggs. There are two points to note about these prices: (1) Retail prices that consumers pay are higher than the prices farmers receive. For example, in early 2023, conventional eggs were selling for more than $4 per dozen in many supermarkets—well above the price farmers were receiving. (2) As mentioned in the chapter opener, in early 2023, egg farmers were still dealing with the effects of the worst outbreak of avian flu in U.S. history. Millions of chickens had died, and the resulting decline in egg supply affected the prices of all types of eggs.

Poultry farmers faced higher costs for producing pastured eggs than for producing cage-free or conventional eggs. As one poultry farmer explained, "Because they're on pasture, the eggs have to be hand collected each day. . . . In addition, we feed our hens certified organic feed, which is almost twice as expensive as the conventional feed." But the high prices farmers were able to sell pastured eggs for made them more profitable than other eggs. We know that the high prices for pastured eggs will fall as more farmers convert to raising their chickens outdoors so they can enter this market. In 2023, industry observers expected that the fraction of chickens farmers raise using conventional methods would decline to only 30 percent by 2027. The remaining 70 percent of chickens would be either cage free or pasture raised. Because the farmers' cost of producing pasture-raised eggs is higher than their cost of producing cage-free eggs, the price of pasture-raised eggs would remain higher than the price of cage-free eggs. As an article on bloomberg.com put it: "If the more humane treatment of animals is a priority in your life, that upcharge may be money well-spent." It was unclear how many consumers would be willing to pay this higher price, making it unclear what fraction of total egg sales each of those types of eggs would account for.

Over time, though, the egg market will again approach a long-run equilibrium in which producing pasture-raised eggs is no more profitable than producing cage-free eggs or conventional eggs—until consumer tastes change yet again.

Your Turn: Test your understanding by doing related problem 5.11 at the end of this chapter.

Increasing-Cost and Decreasing-Cost Industries

Any industry in which the typical firm's average costs do not change as the industry expands production will have a horizontal long-run supply curve, like the one in Figure 12.10. These industries, including the egg industry, are called *constant-cost industries*. It's possible, however, for the typical firm's average costs to change as an industry expands.

For example, if an input used in producing a good is available in only limited quantities, the cost of the input will rise as the industry expands. If only a limited amount of land is available on which to grow the grapes to make a certain variety of wine, an increase in demand for wine made from these grapes will result in competition for the land and will drive up its price. As a result, more of the wine will be produced in the long run only if the price rises to cover the typical firm's higher average cost. In this case, the long-run supply curve will slope upward. Industries with upward-sloping long-run supply curves are called *increasing-cost industries*.

Finally, in some cases, the typical firm's costs may fall as the industry expands. Suppose that someone invents an athletic shoe with a sole made from specialized synthetic material that is currently produced only in small quantities. If demand for the shoes increases, Nike, Adidas, and other athletic shoe manufacturers will increase their orders for the synthetic material. If there are *economies of scale* in producing a good, the average cost of producing it will decline as output increases (see Chapter 11, Section 11.6). If there are economies of scale in producing this synthetic material, the average cost of producing it will fall, and competition will result in its price falling as well. This price decline, in turn, will lower the average cost of producing the new athletic shoes. In the long run, competition will force the price of the shoe to fall to the level of the typical firm's new lower average cost. In this case, the long-run supply curve will slope downward. Industries with downward-sloping long-run supply curves are called *decreasing-cost industries*.

12.6 Perfect Competition and Economic Efficiency

LEARNING OBJECTIVE: Explain how perfect competition leads to economic efficiency.

Notice how powerful consumers are in a market system. If consumers want more cage-free eggs, the market will supply them. More cage-free eggs are supplied not because a government bureaucrat in Washington, DC, or an official in a farmers' association gives orders. The additional eggs are supplied because an increase in demand results in higher prices and a larger profit from selling cage-free eggs. Farmers, trying to get the highest possible return on their investments, begin to switch from producing eggs the conventional way to producing eggs using cage-free methods. If consumers lose their taste for cage-free eggs and demand falls, the process works in reverse. Or, as Adam Smith would put it, *farmers are led by the invisible hand of the market to adapt to changing consumer tastes.*

Productive Efficiency

Productive efficiency A situation in which a good or service is produced at the lowest possible cost.

In a market system, consumers get as many cage-free eggs as they want, produced at the lowest average cost possible. The forces of competition will drive the market price to the typical firm's minimum average cost. **Productive efficiency** refers to the situation in which a good or service is produced at the lowest possible cost. As we have seen, perfect competition results in productive efficiency.

The managers of every firm strive to earn an economic profit by reducing costs. But in a perfectly competitive market, other firms quickly copy ways of reducing costs. Therefore, in the long run, only the consumer benefits from cost reductions.

Solved Problem 12.6

How Productive Efficiency Benefits Consumers

Financial writer Michael Lewis once remarked, "The sad truth, for investors, seems to be that most of the benefits of new technologies are passed right through to consumers free of charge."

a. What do you think Lewis means by the benefits of new technology being "passed right through to consumers free of charge"? Use a graph like Figure 12.8 to illustrate your answer.

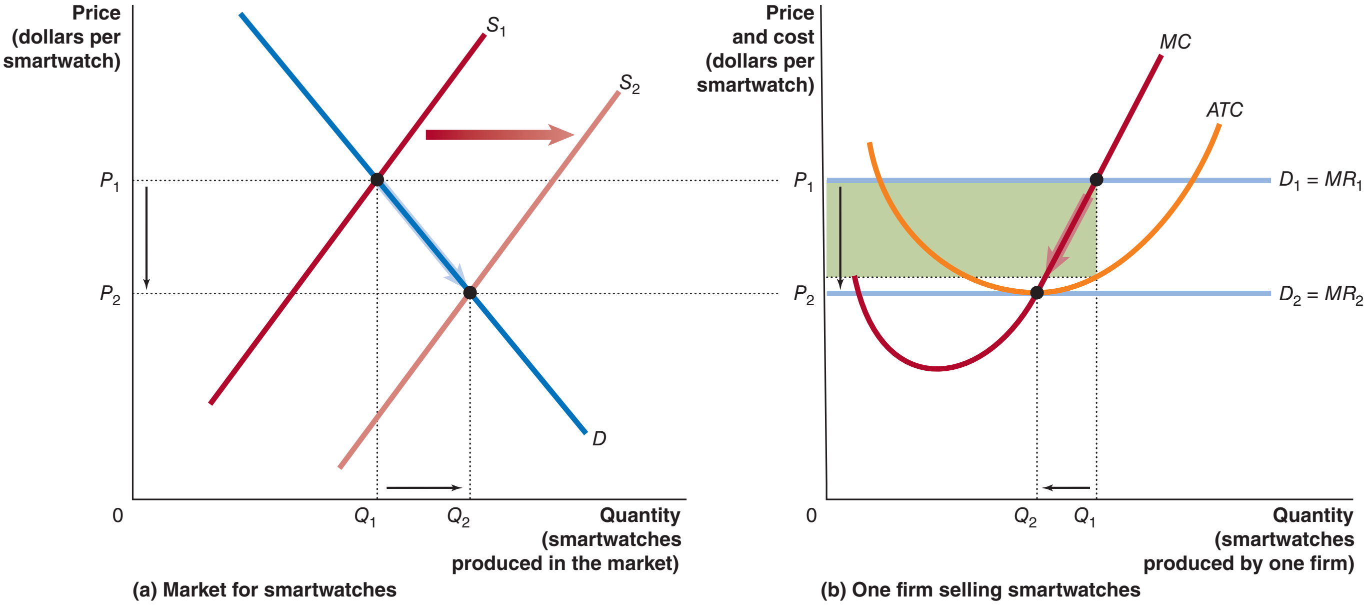
b. Explain why this result is a "sad truth" for investors.

Solving the Problem

Step 1: Review the chapter material. This problem is about perfect competition and efficiency, so you may want to review the section "Perfect Competition and Economic Efficiency."

Step 2: Use the concepts from this chapter to explain what Lewis means. By "new technologies," Lewis means new products—such as smartwatches, electric vehicles, virtual reality headsets, artificial intelligence chatbots, or accident avoidance systems in cars—or lower-cost ways of producing existing products. In either case, new technologies will allow firms to earn an economic profit for a while, but the profit will lead new firms to enter the market in the long run.

Step 3: Use a graph like Figure 12.8 to illustrate why the benefits of new technologies are "passed right through to consumers free of charge." Figure 12.8 shows the situation in which a firm is making an economic profit in the short run but entry eliminates the profit in the long run. We can draw a similar graph to analyze what happens in the long run in the market for smartwatches, which can help monitor your health and enable you to listen to music, send texts, or make phone calls.



(a) Market for smartwatches

(b) One firm selling smartwatches

When smartwatches were first introduced, prices were high, and only a few firms were in the market. Panel (a) shows that the initial equilibrium price in the market for smartwatches is P_1. Panel (b) shows that at this price, the typical firm in the industry is earning an economic profit, which is shown by the green-shaded rectangle. The economic profit attracts new firms into the industry. This entry shifts the market supply curve from S_1 to S_2 in panel (a) and lowers the equilibrium price from P_1 to P_2. Panel (b) shows that at the new market price, P_2, the typical firm is breaking even. Therefore, smartwatches are being produced at the lowest possible cost, and productive efficiency is achieved. Consumers receive the new technology "free of charge" in the sense that they only have to pay a price equal to the lowest possible cost of production.

Step 4: Answer part (b) by explaining why the result in part (a) is a "sad truth" for investors. We have seen in answering part (a) that in the long run, firms only break even on their investment in producing high-technology goods. This result implies that investors in these firms are also unlikely to earn an economic profit in the long run.

Extra Credit: Lewis is using a key result from this chapter: In the long run, the entry of new firms competes away economic profit. Notice that, strictly speaking, the high-technology industries Lewis is discussing are not perfectly competitive. Smartwatches and virtual reality headsets, for instance, are not identical, and each firm in these industries produces a quantity large enough to affect the market price. However, as we will see in the next chapter, these deviations from perfect competition do not change the important conclusion that the entry of new firms benefits consumers by forcing prices down to the level of average cost.

Your Turn: For more practice, do related problems 6.6, 6.7, and 6.8 at the end of this chapter.

Allocative Efficiency

Not only do perfectly competitive firms produce goods and services at the lowest possible cost, they also produce the goods and services that consumers value most. Firms will produce a good up to the point where the marginal cost of producing another unit is equal to the marginal benefit consumers receive from consuming that unit. In other words, firms will supply all those goods that provide consumers with a marginal benefit at least as great as the marginal cost of producing them. This result holds because:

1. The price of a good represents the marginal benefit consumers receive from consuming the last unit of the good sold.
2. Perfectly competitive firms produce up to the point where the price of the good equals the marginal cost of producing the last unit.
3. Firms therefore produce up to the point where the last unit provides a marginal benefit to consumers equal to the marginal cost of producing it.

Allocative efficiency A state of the economy in which production is in accordance with consumer preferences; in particular, every good or service is produced up to the point where the last unit provides a marginal benefit to consumers equal to the marginal cost of producing it.

In other words, entrepreneurs in a competitive market system efficiently *allocate* labor, machinery, and other inputs to produce the goods and services that best satisfy consumer wants. In this way, perfect competition achieves **allocative efficiency**. As we will explore in the next few chapters, many goods and services sold in the U.S. economy are not produced in perfectly competitive markets. Nevertheless, productive efficiency and allocative efficiency are useful benchmarks against which to compare the actual performance of the economy.

Continued from chapter opener

Economics in Your Life & Career

Are You an Entrepreneur?

At the beginning of the chapter, we asked you to think about why you can charge only a relatively low price for babysitting or mowing lawns. In the chapter, we saw that firms selling products in competitive markets can't charge prices higher than competing firms charge. The market for babysitting and mowing lawns is very competitive because in most neighborhoods, there are many teenagers willing to supply these services. The price you can charge for babysitting may not be worth your time when you are 20 but is enough to cover the opportunity cost of a 14-year-old who is eager to enter the market. And the barriers to entering the babysitting and lawn-mowing markets are very low. So, in your career as a teenage entrepreneur, you may have become familiar with one of the lessons of this chapter: A firm in a competitive market has no control over price.

Conclusion

The competitive forces of the market impose relentless pressure on firms to produce new and better goods and services at the lowest possible cost. Firms that fail to adequately anticipate changes in consumer tastes or that fail to adopt the latest and most efficient technology do not survive in the long run. In the nineteenth century, the biologist Charles Darwin developed a theory of evolution based on the idea of the "survival of the fittest," which maintains that only the plants and animals that are best able to adapt to the demands of their environment are able to survive. Darwin first realized the important role that the struggle for existence plays in the natural world after reading early nineteenth-century economists' descriptions of the role it plays in the economic world. Just as "survival of the fittest" is the rule in nature, so it is in the economy.

At the start of this chapter, we saw that there are four market structures: perfect competition, monopolistic competition, oligopoly, and monopoly. Now that we have studied perfect competition, in the following chapters we move on to the other three market structures.

CHAPTER SUMMARY AND PROBLEMS

Key Terms

Allocative efficiency, p. 444
Average revenue (*AR*), p. 422
Economic loss, p. 437
Economic profit, p. 435
Long-run competitive equilibrium, p. 439
Long-run supply curve, p. 439
Marginal revenue (*MR*), p. 423
Perfectly competitive market, p. 419
Price taker, p. 419
Productive efficiency, p. 442
Profit, p. 422
Shutdown point, p. 430
Sunk cost, p. 430

12.1 Perfectly Competitive Markets

LEARNING OBJECTIVE: Explain what a perfectly competitive market is and why a perfect competitor faces a horizontal demand curve.

Summary

A **perfectly competitive market** must have many buyers and sellers; in addition, firms must be producing identical products, and there must be no barriers to new firms entering the market. The demand curve for a good or service produced in a perfectly competitive market is downward sloping, but the demand curve for the output of one firm in a perfectly competitive market is a horizontal line at the market price. Firms in perfectly competitive markets are **price takers**, and their sales drop to zero if they attempt to charge more than the market price.

Review Questions

1.1 What are the three conditions for a market to be perfectly competitive?

1.2 What is a price taker? When are firms likely to be price takers?

1.3 Draw a graph showing the market demand and supply curves for corn and the demand curve for the corn produced by one corn farmer. Be sure to indicate the market price and the price the corn farmer receives.

Problems and Applications

1.4 Explain whether each of the following is a perfectly competitive market. For each market that is not perfectly competitive, explain why it is not.

- **a.** Tomato growing
- **b.** Coffee shops
- **c.** Automobile manufacturing
- **d.** New home construction

1.5 In 2023, an article on barrons.com about Zoom Video Communications's video conferencing services noted that the firm faces "fierce competition" from Microsoft's Teams and other video conferencing services, including those offered by Cisco and Google. Does this "fierce competition" mean that the demand curve for Zoom's video conferencing service is perfectly horizontal? Briefly explain.

1.6 The late Nobel Prize–winning economist George Stigler once wrote that "the most common and most important criticism of perfect competition . . . [is] that it is unrealistic." If few firms sell identical products in markets where there are no barriers to entry, why do economists believe that the model of perfect competition is important?

1.7 [**Related to the Don't Let This Happen to You "Don't Confuse the Demand Curve for Farmer Parker's Wheat with the Market Demand Curve for Wheat"**] Explain whether you agree with the following remark:

> According to the model of perfectly competitive markets, the demand curve for wheat should be a horizontal line. But this can't be true: When the price of wheat rises, the quantity of wheat demanded falls, and when the price of wheat falls, the quantity of wheat demanded rises. Therefore, the demand curve for wheat is not a horizontal line.

1.8 [**Related to the Economics in Your Life & Career**] The financial writer Andrew Tobias described an incident that occurred when he was a student at Harvard Business School: Each student in the class was given large amounts of information about a particular firm and asked to determine a pricing strategy for the firm. Most of the students spent hours preparing their answers and came to class carrying many sheets of paper with their calculations. Tobias came up with the correct answer after just a few minutes and without having made any calculations. When his professor called on him in class for an answer, Tobias stated: "The case said the XYZ Company was in a very competitive industry . . . and the case said that the company had all the business it could handle." Given this information, what price do you think Tobias argued the company should charge? Briefly explain. (Tobias says the class greeted his answer with "thunderous applause.")

1.9 The Kona Brewing Company sells Kona beer. In 2019, the company settled a lawsuit that claimed that it had misleadingly marketed Kona as if it were brewed in Hawaii, when it is actually brewed in Oregon, Washington, Tennessee, and New Hampshire. A few years earlier, Anheuser-Busch settled a lawsuit that claimed that the company had misled consumers into thinking its Beck's beer was brewed in Germany when it was actually brewed in St. Louis. If the market for beer were perfectly competitive, would the location of breweries matter to consumers? Briefly explain.

12.2 How a Firm Maximizes Profit in a Perfectly Competitive Market

LEARNING OBJECTIVE: Explain how a firm maximizes profit in a perfectly competitive market.

Summary

Profit is the difference between total revenue (*TR*) and total cost (*TC*). **Average revenue (*AR*)** is total revenue divided by the quantity of the product sold. A firm maximizes profit by producing the level of output where the difference between revenue and cost is the greatest. This is the same level of output where marginal revenue is equal to marginal cost. **Marginal revenue (*MR*)** is the change in total revenue from selling one more unit.

Review Questions

2.1 Explain why it is true that for a firm in a perfectly competitive market, $P = MR = AR$.

2.2 Explain why at the level of output where the difference between *TR* and *TC* is at its maximum positive value, *MR* must equal *MC*.

2.3 Explain why it is true that for a firm in a perfectly competitive market, the profit-maximizing condition $MR = MC$ is equivalent to the condition $P = MC$.

Problems and Applications

2.4 A student argues: "To maximize profit, a firm should produce the quantity where the difference between marginal revenue and marginal cost is the greatest. If a firm produces more than this quantity, then the profit made on each additional unit will be falling." Briefly explain whether you agree with this reasoning.

2.5 Why don't firms maximize revenue rather than profit? Briefly explain whether a firm that maximized revenue would be likely to produce a smaller or larger quantity than if it were maximizing profit.

2.6 Refer to Table 12.3. Suppose the price of wheat falls to $5.50 per bushel. How many bushels of wheat will Farmer Parker produce, and how much profit will he make? Briefly explain.

2.7 Refer to Table 12.3. Suppose that the marginal cost of wheat is $0.50 higher for every bushel of wheat produced. For example, the marginal cost of producing the eighth bushel of wheat is now $9.50. Assume that the price of wheat remains $7 per bushel. Will this increase in marginal cost change the profit-maximizing level of production for Farmer Parker? Briefly explain.

2.8 In Table 12.3, what is Farmer Parker's fixed cost? Suppose that his fixed cost increases by $10. Will this increase change the profit-maximizing level of production for Farmer Parker? Briefly explain. How much profit will he make now?

12.3 Illustrating Profit or Loss on the Cost Curve Graph

LEARNING OBJECTIVE: Use graphs to show a firm's profit or loss.

Summary

From the definitions of profit and average total cost, we can develop the following expression for the relationship between total profit and average total cost: $\text{Profit} = (P - ATC) \times Q$. Using this expression, we can determine the area showing profit or loss on a cost curve graph: The area of profit or loss is a rectangle with a height equal to price minus average total cost (for profit) or average total cost minus price (for loss) and a base equal to the quantity of output.

Review Questions

3.1 Draw a graph showing a firm that is making a profit in a perfectly competitive market. Be sure your graph includes the firm's demand curve, marginal revenue curve, marginal cost curve, average total cost curve, and average variable cost curve and make sure to indicate the area representing the firm's profit.

3.2 Draw a graph showing a firm that is operating at a loss in a perfectly competitive market. Be sure your graph includes the firm's demand curve, marginal revenue curve, marginal cost curve, average total cost curve, and average variable cost curve and make sure to indicate the area representing the firm's loss.

Problems and Applications

3.3 [**Related to Solved Problem 12.3**] Frances sells pencils in the perfectly competitive pencil market. Her output per day and her total cost are shown in the following table.

Output per Day	Total Cost
0	$1.00
1	2.50
2	3.50
3	4.20
4	4.50
5	5.20
6	6.80
7	8.70
8	10.70
9	13.00

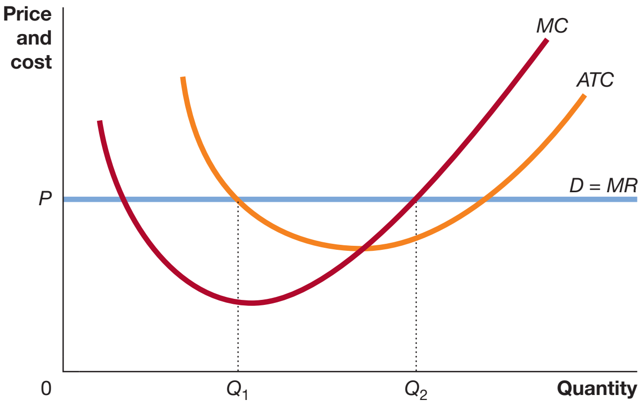
a. If the current equilibrium price in the pencil market is $1.80, how many pencils will Frances produce, what price will she charge, and what will be her profit (or loss)? Draw a graph to illustrate your answer. Your graph should be clearly labeled and should include Frances's demand, *ATC*, *AVC*, *MC*, and *MR* curves; the price she is charging; the quantity she is producing; and the area representing her profit (or loss).

b. Suppose the equilibrium price of pencils falls to $1.00. Now how many pencils will Frances produce, what price will she charge, and what will be her profit (or loss)? Show your work. Draw a graph to illustrate this situation, using the instructions in part (a).

- **c.** Suppose the equilibrium price of pencils falls to \$0.25. Now how many pencils will Frances produce, what price will she charge, and what will be her profit (or loss)?

3.4 **[Related to Solved Problem 12.3]** Review Solved Problem 12.3 and then suppose the equilibrium price of basketballs falls to \$2.50. Now how many basketballs will Andy produce? What price will he charge? What will be his profit (or loss)?

3.5 **[Related to the Don't Let This Happen to You "Remember That Firms Maximize Their Total Profit, *Not* Their Profit per Unit"]** A student examines the following graph and argues: "I believe that a firm will want to produce at Q_1, not at Q_2. At Q_1, the distance between price and marginal cost is the greatest. Therefore, at Q_1, the firm will be maximizing its profit." Briefly explain whether you agree with the student's argument.

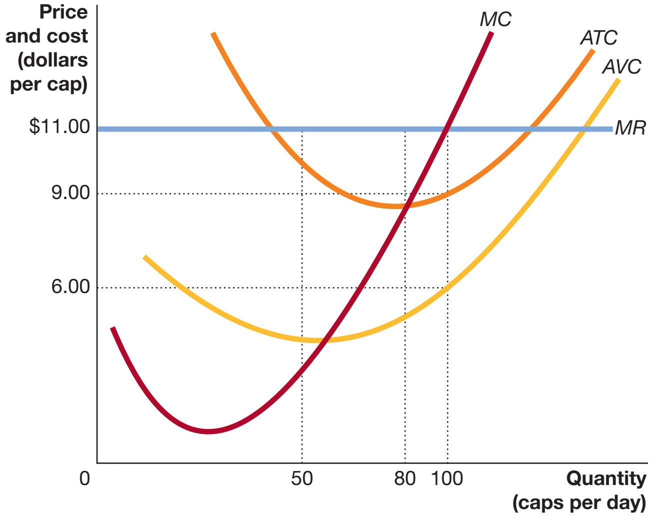


3.6 Answer the following two questions about the relationship between a firm's revenue and its profit.

- **a.** In early 2023, Tesla announced that in the last three months of 2022, its revenue increased by 37 percent from the same period in the previous year, while its profit increased by 59 percent. Was it necessary for Tesla's revenue to increase for its profit to increase? Briefly explain.
- **b.** In early 2023, IBM reported that in the last three months of 2022, its profit increased by \$380 million, while its revenue declined by \$10 million. How was it possible for IBM's profit to increase at the same time that its revenue fell? Can IBM maximize its profit without maximizing its revenue? Briefly explain.

3.7 Suppose that most wheat farms are suffering losses. Now suppose that a new scientific study shows that eating four slices of whole wheat bread per day is an effective means of weight control, lowers blood pressure, and reduces the likelihood of heart disease. Assume that this study leads to the typical wheat farm earning an economic profit. Use two graphs to illustrate the effect of the release of the study: one graph showing the effect on the market for wheat and another graph showing the effect on a representative wheat farm. Be sure your graph for the wheat market shows any shifts in the market demand and supply curves and any changes in the equilibrium market price. Be sure that your graph for the representative farm includes its marginal revenue curve, marginal cost curve, average total cost curve, any change in its demand curve, and the area showing its loss before the release of the study and its profit after the release.

3.8 The following graph represents the situation of Marguerite's Caps, a firm selling caps in the perfectly competitive cap industry. In each part of this problem, be sure to show how you calculated your answer.



- **a.** How much output should Marguerite produce to maximize her profit?
- **b.** How much profit will she earn?
- **c.** Suppose Marguerite decides to quit the cap industry and shut down. What would her loss be?

12.4 Deciding Whether to Produce or to Shut Down in the Short Run

LEARNING OBJECTIVE: Explain why firms may shut down temporarily.

Summary

In deciding whether to shut down or produce in the short run, a firm should ignore its *sunk costs.* A **sunk cost** is a cost that has already been paid and that cannot be recovered. In the short run, a firm continues to produce as long as its price is at least equal to its average variable cost. A perfectly competitive firm's **shutdown point** is the minimum point on the firm's average variable cost curve. If price falls below average variable cost, the firm shuts down in the short run. For prices above the shutdown point, a perfectly competitive firm's marginal cost curve is also its supply curve.

Review Questions

4.1 What is the difference between a firm's shutdown point in the short run and in the long run? Why are firms willing to accept losses in the short run but not in the long run?

4.2 What is the relationship between a perfectly competitive firm's marginal cost curve and its supply curve?

4.3 How is the market supply curve derived from the supply curves of individual firms?

Problems and Applications

4.4 Consider a firm in each of the following three situations. For each situation, carefully explain whether the firm will produce in the short run or shut down in the short run.

	Situation 1	Situation 2	Situation 3
Price	$10	$10	$10
Quantity	1,000	1,000	1,000
Variable cost	$5,000	$5,000	$11,000
Fixed cost	$5,000	$6,000	$5,000
Marginal cost of 1,000th unit	$10	$10	$10

4.5 Marc Randolph founded Netflix with Reed Hastings. In a book about his experiences, Randolph wrote that in early 2001, he came to realize that "there had to be a point where not only were we making money from each customer each month, there were enough customers to cover the fixed costs of running the business." At that point, before streaming movies had become possible, Netflix's business consisted of customers renting DVDs by mail.

- **a.** Identify one fixed cost of running Netflix in 2001 and explain why that cost was fixed.
- **b.** In 2001, what was the relationship between Netflix's revenue and its variable cost?
- **c.** Was Netflix earning a profit? If not, why would the firm continue operating?

4.6 Ed Scahill produces desk lamps in the perfectly competitive desk lamp market.

- **a.** Fill in the missing values in the table below.

Output per Week	Total Cost	*AFC*	*AVC*	*ATC*	*MC*
0	$100				
1	150				
2	175				
3	190				
4	210				
5	240				
6	280				
7	330				
8	390				
9	460				
10	540				

- **b.** Suppose the equilibrium price in the desk lamp market is $50. How many desk lamps should Ed produce, and how much profit will he make?
- **c.** If next week the equilibrium price of desk lamps drops to $30, should Ed shut down? Explain.

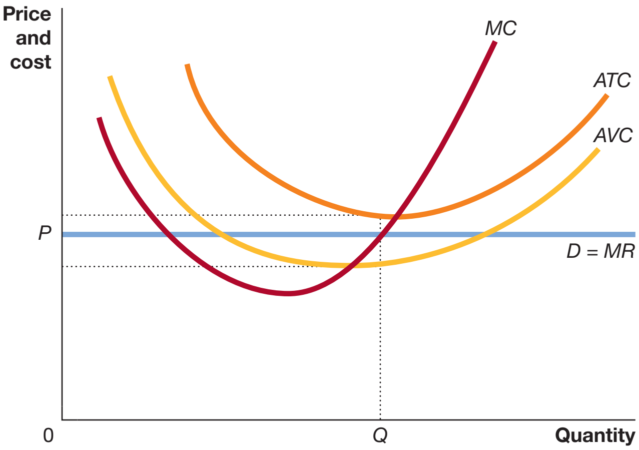
4.7 Matt Rafferty produces hiking boots in the perfectly competitive hiking boots market.

- **a.** Fill in the missing values in the following table.

Output per Week	Total Cost	*AFC*	*AVC*	*ATC*	*MC*
0	$100.00				
1	155.70				
2	205.60				
3	253.90				
4	304.80				
5	362.50				
6	431.20				
7	515.10				
8	618.40				
9	745.30				
10	900.00				

- **b.** Suppose the equilibrium price in the hiking boots market is $100. How many pairs of boots should Matt produce, what price should he charge, and how much profit will he make?
- **c.** If next week the equilibrium price of boots drops to $65, how many pairs of boots should Matt produce, what price should he charge, and how much profit (or loss) will he make?
- **d.** If the equilibrium price of boots falls to $50, how many pairs of boots should Matt produce, what price should he charge, and how much profit (or loss) will he make?

4.8 **[Related to the Apply the Concept "What Does 'Break Even' Mean for an AI Entrepreneur?"]** The following graph represents the situation of a perfectly competitive firm. Indicate on the graph the areas that represent the following:



- **a.** Total cost
- **b.** Total revenue
- **c.** Variable cost
- **d.** Profit or loss

Briefly explain whether the firm will continue to produce in the short run.

4.9 **[Related to Solved Problem 12.4]** An article in the *Wall Street Journal* about companies drilling in shale oil fields notes that "banks have provided financing when [oil] producers spend more cash than they take in from operations." If a company spends more to produce oil than it receives in revenue from selling the oil, isn't it suffering a loss? If so, why does the company remain in business, and why are banks willing to lend it money?

4.10 **[Related to Solved Problem 12.4]** Suppose you decide to open a copy store. You rent store space (signing a 1-year lease to do so), and you take out a loan at a local bank and use the money to purchase 10 copiers. Six months later, a large chain opens a copy store two blocks away from yours. As a result, the revenue you receive from your copy store, while sufficient to cover the wages of your employees and the costs of paper and utilities, doesn't cover all your rent and the interest and repayment costs on the loan you took out to purchase the copiers. Briefly explain whether you should continue operating your business.

4.11 **[Related to Solved Problem 12.4]** In early 2023, Bed Bath & Beyond announced that it had lost $396 million during the last three months of 2022. According to an article in the *Wall Street Journal*, as part of its plan to reduce it losses, the company was "in the process of closing about 150 underperforming stores." The company had signed leases to rent the buildings those stores were in. Would Bed Bath & Beyond's losses be reduced if it closed every store that was earning less in revenue than the variable cost of operating the store? Briefly explain.

4.12 In May 2021, many businesses in the United States began fully reopening as local governments eased restrictions on capacity imposed to contain the spread of Covid–19. An article on crainsnewyork.com discussed the decisions Starbucks was making about its stores in New York City. Starbucks intended to keep some stores open, permanently close some stores, and wait to permanently close about 20 other stores "when their leases end in the next year." Analyze the relationship between cost and revenue for each of these three categories of Starbucks stores: (1) the stores that Starbucks planned to keep open permanently; (2) the stores that the firm would permanently close; and (3) the stores that would remain open only until their leases expired. In particular, be sure to explain why Starbucks wasn't going to close the stores in the third category immediately but was instead waiting until their leases expired.

4.13 In early 2021, the Walt Disney Company was attempting to reopen its theme parks while maintaining restrictions on its operations to reduce the spread of Covid–19. Disney's Chief Financial Officer (CFO) Christine McCarthy discussed the situation at the firm's Walt Disney World theme park. She noted that "revenue exceeded the variable costs" of operating the park.

- **a.** Does "revenue exceeded the variable costs" mean that operating Disney World increased the Disney Company's profit? What additional information would you need to decide?
- **b.** If operating the park was adding to the company's losses, would the company continue operating the park in the short run? In the long run? Briefly explain.

12.5 "If Everyone Can Do It, You Can't Make Money at It": The Entry and Exit of Firms in the Long Run

LEARNING OBJECTIVE: Explain how entry and exit ensure that perfectly competitive firms earn zero economic profit in the long run.

Summary

Economic profit is a firm's revenue minus all its costs, implicit and explicit. **Economic loss** is the situation in which a firm's total revenue is less than its total cost, including all implicit costs. If firms make an economic profit in the short run, new firms enter the industry until the market price has fallen enough to eliminate the profit. If firms suffer an economic loss, firms exit the industry until the market price has risen enough to wipe out the loss. **Long-run competitive equilibrium** is the situation in which the entry and exit of firms has resulted in the typical firm breaking even. The **long-run supply curve** shows the relationship between market price and the quantity supplied.

Review Questions

5.1 When are firms likely to enter an industry? When are they likely to exit an industry?

5.2 A February 2022 article in the *Wall Street Journal* reported that prices of soybeans had risen because "abnormally dry weather in South America . . . has affected soybeans there, and U.S. farmers are poised to take advantage by planting more this year." The U.S. Department of Agriculture had forecast that Brazil and Argentina would produce 134 million and 45 million tons of soybeans, respectively, in 2022.

- **a.** Describe the three characteristics of a perfectly competitive market. Based on these characteristics, do you believe the market for soybeans is perfectly competitive? Briefly explain.
- **b.** Assume that U.S. farmers did "take advantage" of higher soybean prices "by planting more" in 2022. Holding everything else constant, how would this have affected the supply of soybeans and the equilibrium price in 2022 and 2023?

5.3 Briefly explain whether a firm earning zero economic profit will continue to produce in the long run.

5.4 Describe the shape of the long-run supply curve in a perfectly competitive market. Suppose that a perfectly competitive market is initially at long-run equilibrium, and then there is a permanent decrease in the demand for the product. Draw a graph showing how the market adjusts in the long run.

Problems and Applications

5.5 Suppose an assistant professor of economics is earning a salary of $75,000 per year. One day she quits her job, withdraws $100,000 from a bank certificate of deposit (CD) that had been earning 3 percent per year, and uses the funds to open a bookstore. At the end of the year, she shows an accounting profit of $80,000 on her income tax return. What is her economic profit?

5.6 Jason Furman is a professor of the practice of economic policy at Harvard University and served as chair of President Barack Obama's Council of Economic Advisers. An article in the *Wall Street Journal* quoted Furman as saying that "even in perfect competition an increase in demand will cause prices and profits to go up in the short run 'because it takes time for new firms to enter and compete away those profits.'"

- **a.** Draw two graphs: one that shows the demand curve and the supply curve for a perfectly competitive industry and another that shows a demand curve, a marginal cost curve, and an average total cost curve for a representative firm in this industry. Assume that the market is in long-run equilibrium. Be sure to label all the curves in your graphs.
- **b.** Explain how your graphs show that firms in this industry don't earn an economic profit.
- **c.** Refer to your graphs to describe how an "increase in demand will cause profits for the firm to go up in the short run."
- **d.** Refer to your graphs to explain how the entry of new firms will "compete away" profits firms had earned in the short run.

5.7 **[Related to the Chapter Opener]** The following questions are about long-run equilibrium in the market for cage-free eggs.

- **a.** According to the chapter opener, in 2023, was the market for cage-free eggs in long-run equilibrium? Briefly explain.
- **b.** What would we expect to happen to the price of cage-free eggs and the quantity of cage-free eggs produced in the long run? Briefly explain.
- **c.** As of 2023, the U.S. Department of Agriculture (USDA) did not have detailed guidelines for egg farmers to follow to claim that the eggs they sell were laid by pasture-raised chickens—beyond requiring that the chickens "have continuous, free access to the outdoors." Some animal rights activists were pushing for the USDA to enact stricter guidelines. Such guidelines might significantly raise the cost of producing pasture-raised eggs. Suppose that the USDA begins to require stricter guidelines. What effect will this increase in cost have on the long-run price of pasture-raised eggs? In the long run, will the quantity of pasture-raised eggs be larger, smaller, or the same as it would have been without the USDA adopting the guidelines? Briefly explain.

5.8 **[Related to the Apply the Concept "It's Tough to Earn a Profit Reselling Sneakers"]** During the Covid–19 pandemic, many brick-and-mortar small businesses decided that they needed to develop websites to sell products online. According to an article in the *Wall Street Journal*, one entrepreneur in Walla Walla, Washington, initially found he was able to earn a profit developing websites for local small businesses. Eventually, however, the entrepreneur discovered that he "was not the only one to have this brilliant idea." Briefly explain which of the following you would expect to be true in the *long run*.

- **a.** Entrepreneurs will earn zero accounting profit from developing websites for small businesses.
- **b.** An entrepreneur in this industry will produce the quantity of this service at which marginal revenue from selling the service is greater than the marginal cost of producing the service.
- **c.** An entrepreneur in this industry will receive a price for this service equal to the average cost of producing the service.
- **d.** An entrepreneur in this industry will produce the quantity of this service at which marginal revenue from selling the service is less than the marginal cost of producing the service.

5.9 In panel (b) of Figure 12.9, Sacha Gillette reduces her output from 40,000 to 25,000 dozen eggs when the price falls to $1.75. At this price and this output level, she is operating at a loss. Why doesn't she just continue charging the original $2.00 and continue producing 40,000 dozen eggs?

5.10 Palm oil is made from the fruit of oil palm trees that are grown primarily on farms in Asia and Africa. An article in the *Wall Street Journal* in early 2021 reported that palm oil prices had doubled since May 2020, following an increase in demand. According to the article, palm oil "has gained popularity as an ingredient in food products such as cookies, nondairy spreads, and instant noodles." Illustrate developments in the market for palm oil using two graphs. One graph should show (1) the short-run effect of the increase in demand for palm oil and (2) the long-run effect of the initial price increase. The second graph should show the short-run and long-run situations of a representative farm producing oil palm tree fruit. Be sure to carefully label all the curves in your graphs and indicate how any of the curves have shifted.

5.11 **[Related to the Apply the Concept "The Winding Path to Long-Run Equilibrium in the Egg Market"]** An article on forbes.com discussed a business decision by Matt O'Hayer, owner of Vital Farms. O'Hayer was one of the first poultry farmers to begin selling pastured eggs. He committed to raising his chickens with each having 108 feet of outdoor space. According to the article, "It was one of many decisions he made knowing it would likely limit his company's growth."

- **a.** In what sense did O'Hayer's decision to take on these additional costs of raising chickens limit his company's growth? Wouldn't his farm have been more profitable if he had kept his costs down by raising chickens the traditional way, confining them indoors in small cages?
- **b.** Briefly explain what is likely to happen to the profitability of O'Hayer's farm in the long run.

5.12 Suppose that currently the market for gluten-free spaghetti is in long-run equilibrium at a price of $3.50 per box and a quantity of 4 million boxes sold per year. If the demand for gluten-free spaghetti permanently increases, which of the following combinations of equilibrium price and equilibrium quantity would you expect to see in the long run? Carefully explain why you chose the answer you did.

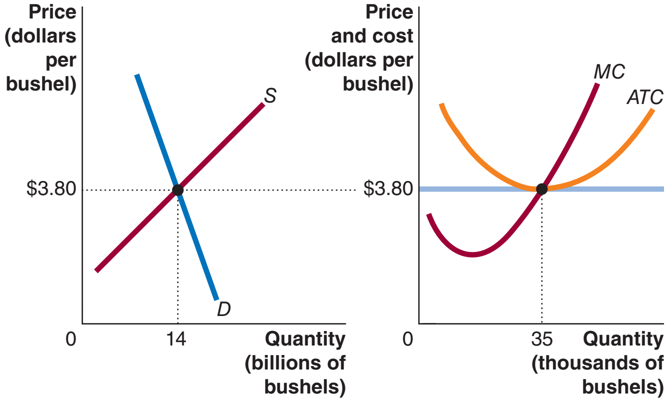
- **a.** A price of $3.50 per box and a quantity of 4 million boxes
- **b.** A price of $3.50 per box and a quantity of more than 4 million boxes
- **c.** A price of more than $3.50 per box and a quantity of more than 4 million boxes
- **d.** A price of less than $3.50 per box and a quantity of fewer than 4 million boxes

5.13 Suppose that each of the following is true: (1) The laptop computer industry is perfectly competitive, and the firms that assemble laptops do not also make the displays or screens; (2) the laptop display industry is also perfectly competitive; and (3) because the demand for laptop displays is currently relatively small, firms in the laptop display industry have not been able to take advantage of all the economies of scale in laptop display production. Use a graph of the laptop computer market to illustrate the long-run effects on equilibrium price and quantity in the laptop computer market of a substantial and sustained increase in the demand for laptop computers. Use another graph to show the effect on the cost curves of a typical firm in the laptop computer industry. Briefly explain your graphs. Do your graphs indicate that the laptop computer industry is a constant-cost industry, an increasing-cost industry, or a decreasing-cost industry?

5.14 According to an article in the *Wall Street Journal*, in 2023, the Permian Basin and other U.S. oil fields were beginning to produce less oil from each oil well. The result will "eventually . . . push companies to tap lower quality wells that would require higher oil prices to attract investment, industry executives say." If this analysis is correct, what is likely to be true about the oil industry's long-run supply curve?

5.15 Economist Avinash Dixit of Princeton once wrote, "Never have I arrived at a coffee shop only to be told, 'Sorry; we don't have coffee today.' . . . How did they know I would come and why were they ready and willing to serve me?" Briefly answer his question.

5.16 Suppose that at the beginning of a year, the price of corn is $3.80 per bushel, and 14 billion bushels of corn are harvested. There are approximately 400,000 corn farmers, so the average output per farmer is about 35,000 bushels. The following graphs assume that the market for corn is initially in long-run equilibrium. Favorable weather during the year increases the total corn harvest to 16 billion bushels. Assume that no other factors affect the market for corn.



a. What percentage of the total corn output did the average corn farmer produce at the beginning of the year?

b. Show on the graph for the total market for corn and the graph for the typical farm any changes that occur in the short run as a result of the increase in the corn harvest. Be sure to note whether any curves shift and whether there are any changes in the equilibrium price or the equilibrium quantities.

c. Show on the graph for the total market for corn and the graph for the typical farm any changes that occur in the long run as a result of the increase in the corn harvest. Be sure to note whether any curves shift and whether there are any changes in the equilibrium price or the equilibrium quantities.

12.6 Perfect Competition and Economic Efficiency

LEARNING OBJECTIVE: Explain how perfect competition leads to economic efficiency.

Summary

Perfect competition results in **productive efficiency**, which means that goods and services are produced at the lowest possible cost. Perfect competition also results in **allocative efficiency**, which means that goods and services are produced up to the point where the last unit provides a marginal benefit to consumers equal to the marginal cost of producing it.

Review Questions

6.1 Why are consumers so powerful in a market system?

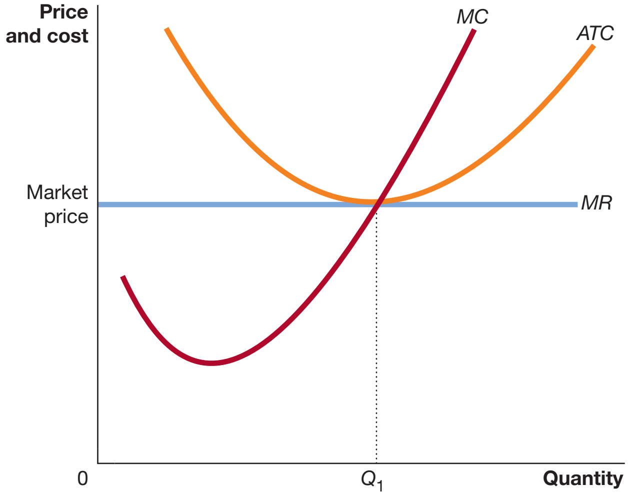
6.2 What is meant by *allocative efficiency*? What is meant by *productive efficiency*? Briefly discuss the difference between these two concepts.

6.3 How does perfect competition lead to allocative efficiency and productive efficiency?

Problems and Applications

6.4 The chapter states, "Firms will supply all those goods that provide consumers with a marginal benefit at least as great as the marginal cost of producing them." A student objects to this statement, arguing, "I doubt that firms will really do this. After all, firms are in business to make a profit; they don't care about what is best for consumers." Evaluate the student's argument.

6.5 The following graph represents the situation of Karl's Kumquats, a kumquat grower.



a. How much profit is Karl's Kumquats earning?

b. Does the current situation of Karl's Kumquats illustrate productive efficiency or allocative efficiency? If so, briefly explain how.

6.6 [**Related to Solved Problem 12.6**] Discuss the following statement: "In a perfectly competitive market, in the long run consumers benefit from reductions in costs, but firms don't." Don't firms also benefit from cost reductions because they are able to earn larger profits?

6.7 [**Related to Solved Problem 12.6**] Suppose you read the following item in a newspaper article, under the headline "Price Gouging Alleged in Pencil Market":

> Consumer advocacy groups charged at a press conference yesterday that there is widespread price gouging in the sale of pencils. They released a study showing that whereas the average retail price of pencils was $1.00, the average cost of producing pencils was only $0.50. "Pencils can be produced without complicated machinery or highly skilled workers, so there is no justification for companies charging a price that is twice what it costs them to produce the product. Pencils are too important in the life of every American for us to tolerate this sort of price gouging any longer," said George Grommet, chief spokesperson for the consumer groups. The consumer groups advocate passing a law that would allow companies selling pencils to charge a price no more than 20 percent greater than their average cost of production.

Do you believe such a law would be advisable in a situation like this? Explain.

6.8 [**Related to Solved Problem 12.6**] An economist argues:

> The purpose of the competitive market system is to destroy businesses. The competitive market system acts like the cyborg played by Arnold Schwarzenegger in the movie *The Terminator*, wiping out any firm that can't get out of its way. Without the destruction caused by competition, the economy could not achieve productive and allocative efficiency.

a. Briefly explain whether you agree with this argument.

b. Do all firms lose as a result of the competitive market process? Do all consumers win? Briefly explain.

6.9 Nearly all of the auto makers that sell cars in the United States also sell cars in China. In addition, according to an article in the *Wall Street Journal*, in China dozens of "local auto makers are kept alive by government support." We can conclude that there are more firms competing in the Chinese auto market than in the U.S. auto market. Can we also conclude that the Chinese auto market is more productively efficient than the U.S. auto market? More allocatively efficient? Briefly explain.

6.10 Hedrick Smith was a foreign correspondent for the *New York Times* who lived in the Soviet Union in the 1970s, a period when the country had a planned economy rather than a market system. In a book he wrote about everyday life in the Soviet Union, Smith made the following observations about shopping in Moscow:

> At first it seemed . . . that the stores were pretty well stocked. Only as we began to shop in earnest . . . did the Russian consumer's predicament really come through to me. First, we needed textbooks for our children . . . and found that the sixth-grade textbooks had run out. . . . We tried to find ballet shoes for our 11-year-old daughter . . . only to discover that in this land of ballerinas, ballet shoes size 8 were unavailable in Moscow. . . . I tried to find shoes for myself. They were out of anything in my size but sandals or flimsy, lightweight shoes that the clerk, with one look at me, recommended against buying. "They won't last," he admitted.

a. Judging by Smith's observations, briefly explain whether the Soviet Union achieved allocative efficiency in the production of sixth-grade textbooks, ballet shoes, and men's shoes.

b. Can we tell from these observations whether the Soviet Union achieved productive efficiency in the production of sixth-grade textbooks, ballet shoes, and men's shoes? Briefly explain.

Critical Thinking Exercises

CT12.1 In a perfectly competitive market in the long run, can you say anything definite about the elasticity of the market supply curve? Can you say anything definite about the elasticity of the market demand curve? Briefly explain.

CT12.2 Suppose a perfectly competitive firm finds a way to reduce its fixed cost. Briefly explain whether each of the following will change for the firm. Use a graph to illustrate your answer.

a. Average total cost
b. Profit
c. Average variable cost
d. Marginal cost
e. Average fixed cost
f. The firm's supply curve

CT12.3 Some professions, such as hair cutting or hair braiding, are fairly close to perfectly competitive. These professions sometimes succeed in getting the government to establish licensing requirements that deter some competitors from entering the profession. Why might these professions want to impose such licensing requirements? Why might the government choose to impose such requirements? Use the concepts from this chapter to explain your answer.

13

Monopolistic Competition: The Competitive Model in a More Realistic Setting

Starbucks Reacts to Competition from Third Wave Coffeehouses

Starbucks started small. In 1971, Gordon Bowker, Gerald Baldwin, and Zev Siegl opened the first Starbucks in Seattle, Washington. Howard Schultz joined the company 10 years later. Schultz realized that many consumers wanted to drink coffee in an environment where they could relax, read, and chat. He also believed there was an unmet consumer demand for higher-quality coffee than most diners or donut shops served. Designing Starbucks coffeehouses to provide this experience was the key to the firm's success.

But eventually Starbucks faced two important sources of competition:

- Coffeehouse chains, such as Peet's Coffee and Caribou Coffee, that copied the Starbucks approach.
- Third wave coffeehouses, such as Blue Bottle Coffee, with headquarters in Oakland, California, Intelligentsia, which is based in Chicago, and City Girl Coffee, which is based in Duluth, Minnesota. Third wave coffee is usually directly sourced, which means that these coffeehouses buy coffee beans from coffee growers rather than from wholesalers. The owners of third wave coffeehouses argue that they serve better-tasting coffee because they personally select the coffee beans and make sure the coffee is served shortly after being harvested. Although these coffeehouses generally charge higher prices than does Starbucks, their popularity has been growing.

In response to competition, Starbucks has searched for ways to differentiate its coffeehouses. For instance, during the decade of the 2010s, Starbucks (1) began allowing customers to customize drinks (supposedly in 170,000 ways), (2) pioneered technology that allows customers to pay with a smartphone, (3) implemented a loyalty program, and (4) improved in-store Wi-Fi to make it easier for customers to stay in the store longer, working on their laptops.

But other large chains have been able to copy all of these innovations, forcing Starbucks to search for new ways to differentiate itself from competitors. Although Starbucks built its success on making its stores appealing places for customers to spend time, in recent years it has seen a surge in drive-through orders in locations that offer them. Schultz plans for 90 percent of new stores to have drive-through windows. Starbucks is spending $450 million for new equipment, with the aim of reducing the time spent preparing orders by 50 percent. Starbucks managers are also redesigning the layout behind the counter to make filling orders both faster and less physically demanding on employees. Schultz stepped down as CEO on April 1, 2023. He was optimistic that these changes would allow Starbucks to continue earning an economic profit.

Larry W Smith/EPA-EFE/Shutterstock

In Chapter 12, we saw that perfectly competitive markets share three key characteristics:

1. There are many firms.
2. All firms sell identical products.
3. There are no barriers to new firms entering the industry.

Starbucks competes in a market that shares two of these characteristics: There are many coffeehouses, and the barriers to entering the market are very low. But the products that coffeehouses sell are differentiated rather than identical. So, the market is *monopolistically competitive* rather than perfectly competitive.

As we will see in this chapter, in the long run, most monopolistically competitive firms are unable to earn an economic profit. So, the increases in economic profit that Starbucks earns from customization and other aspects of its strategy are unlikely to persist in the face of vigorous competition from other firms in the industry.

Chapter Outline & Learning Objectives

13.1 Demand and Marginal Revenue for a Firm in a Monopolistically Competitive Market, page 456
Explain why a monopolistically competitive firm has downward-sloping demand and marginal revenue curves.

13.2 How a Monopolistically Competitive Firm Maximizes Profit in the Short Run, page 459
Explain how a monopolistically competitive firm maximizes profit in the short run.

13.3 What Happens to Profits in the Long Run? page 462
Analyze the situation of a monopolistically competitive firm in the long run.

13.4 Comparing Monopolistic Competition and Perfect Competition, page 467
Compare the efficiency of monopolistic competition and perfect competition.

13.5 How Marketing Differentiates Products, page 470
Define marketing and explain how firms use it to differentiate their products.

13.6 What Makes a Firm Successful? page 471
Identify the key factors that determine a firm's success.

Economics in Your Life & Career

Can You Operate a Successful Restaurant?

After you graduate, you plan to realize your dream of opening an Italian restaurant. You have many questions to answer and decisions to make, including these: Will the restaurant be "family style," with inexpensive furniture, or will it be more elegant, with expensive furniture and elegant tablecloths and candles? Will you offer a full menu or concentrate on pasta dishes made with your grandmother's secret sauce? The decisions you make will distinguish your restaurant from competitors. What's likely to happen in the restaurant market in your hometown after you open your restaurant? How successful are you likely to be? Try to answer these questions as you read this chapter. You can check your answers against those we provide at the end of this chapter.

Many markets in the U.S. economy are similar to the coffeehouse market: There are many buyers and sellers, and the barriers to entry are low, but the goods and services offered for sale are differentiated rather than identical. Examples of these markets include pizza restaurants, movie theaters, supermarkets, and furniture stores. In fact, the majority of the firms you buy from are competing in **monopolistically competitive** markets.

Monopolistic competition A market structure in which barriers to entry are low and many firms compete by selling similar, but not identical, products.

We have seen how perfect competition benefits consumers and results in economic efficiency. Will these same desirable outcomes also hold for monopolistically competitive markets? This question is important because monopolistically competitive markets are very common.

13.1 Demand and Marginal Revenue for a Firm in a Monopolistically Competitive Market

LEARNING OBJECTIVE: Explain why a monopolistically competitive firm has downward-sloping demand and marginal revenue curves.

In the chapter opener, we noted the growing popularity of third wave coffeehouses. Blue Bottle Coffee is a third wave coffeehouse chain that James Freeman started in 2002 in Oakland, California. In 2017, Nestlé, the Swiss food company, purchased Blue Bottle, and by 2019, the chain had opened coffeehouses in several other U.S. cities and in Japan. Suppose that a Blue Bottle coffeehouse is located a mile from where you live. One day, the manager decides to raise the price of a cup of cappuccino from $3.50 to $4.00. As a result, some Blue Bottle customers will switch to buying cappuccinos at other coffeehouses, such as Starbucks. But other customers will be willing to pay the higher price for a variety of reasons: This coffeehouse may be closer to them, or they may prefer Blue Bottle's cappuccinos to similar coffee at competing coffeehouses. So, a Blue Bottle coffeehouse will face a downward-sloping demand curve, unlike a wheat farmer, who will sell no wheat if he raises his price and who, therefore, faces a horizontal demand curve.

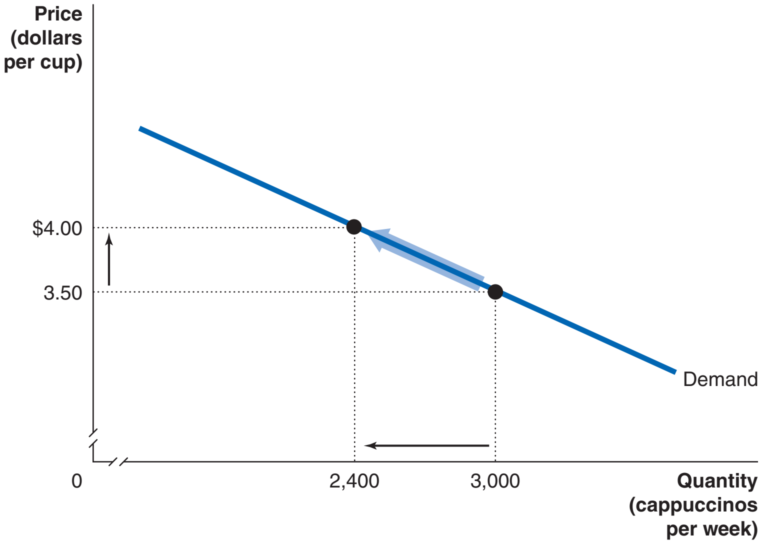
The Demand Curve for a Monopolistically Competitive Firm

Figure 13.1 shows how a change in price affects the quantity of cappuccinos a Blue Bottle coffeehouse sells. The increase in the price from $3.50 to $4.00 decreases the quantity of cappuccinos consumers demand from 3,000 per week to 2,400 per week.

Figure 13.1

The Downward-Sloping Demand Curve for Cappuccinos at Blue Bottle

If a Blue Bottle coffeehouse increases the price of its cappuccinos, it will lose some, but not all, of its customers. In this case, raising the price from $3.50 to $4.00 reduces the quantity of cappuccinos consumers demand from 3,000 per week to 2,400. Therefore, unlike a perfect competitor, a Blue Bottle coffeehouse faces a downward-sloping demand curve.



Marginal Revenue for a Firm with a Downward-Sloping Demand Curve

For a firm in a perfectly competitive market, the demand curve and the marginal revenue curve are the same (see Chapter 12, Section 12.2). A perfectly competitive firm faces a horizontal demand curve and does not have to cut the price to sell a larger quantity. A monopolistically competitive firm, however, must cut the price to sell more, so its marginal revenue curve will slope downward and will be below its demand curve.

The data in Table 13.1 illustrate this point. To keep the numbers simple, let's assume that your local Blue Bottle coffeehouse is very small and sells at most 10 cappuccinos per week. If this Blue Bottle charges a price of \$6.00 or more, all of its potential customers will buy their cappuccinos somewhere else. If it charges \$5.50, it will sell 1 cappuccino per week. For each additional \$0.50 this Blue Bottle reduces the price, it increases the number of cappuccinos it sells by 1. The third column in the table shows how the firm's *total revenue* changes as it sells more cappuccinos. The fourth column shows the firm's revenue per unit, or its *average revenue*. Average revenue is equal to total revenue divided by quantity. Because total revenue equals price multiplied by quantity, dividing by quantity leaves just price. Therefore, *average revenue is always equal to price*. This result will be true for firms selling in any of the four market structures we described at the beginning of Chapter 12.

The last column in Table 13.1 shows the firm's marginal revenue, or the change in total revenue as the firm sells 1 more cappuccino. For a perfectly competitive firm, the additional revenue received from selling 1 more unit is just equal to the price. That will *not* be true for this Blue Bottle coffeehouse because to sell another cappuccino, it has to reduce the price. When the firm cuts the price by \$0.50, one good thing happens, and one bad thing happens:

- **The good thing:** It sells 1 more cappuccino; we can call this the *output effect*.
- **The bad thing:** It receives \$0.50 less for each cappuccino that it could have sold at the higher price; we can call this the *price effect*.

Figure 13.2 illustrates what happens when the firm cuts the price from \$3.50 to \$3.00. Selling the sixth cappuccino adds the \$3.00 price to the firm's revenue; this is the output effect. But this Blue Bottle coffeehouse now receives a price of \$3.00, rather than \$3.50, on the first 5 cappuccinos sold; this is the price effect. As a result of the price effect, the firm's revenue on these 5 cappuccinos is \$2.50 less than it would have been if the price had remained at \$3.50. So, the firm has gained \$3.00 in revenue on the sixth cappuccino and lost \$2.50 in revenue on the first 5 cappuccinos, for a net change in revenue of \$0.50. Marginal revenue is the change in total revenue from selling 1 more unit. Therefore, the marginal revenue of the sixth cappuccino is \$0.50. Notice that the

Table 13.1

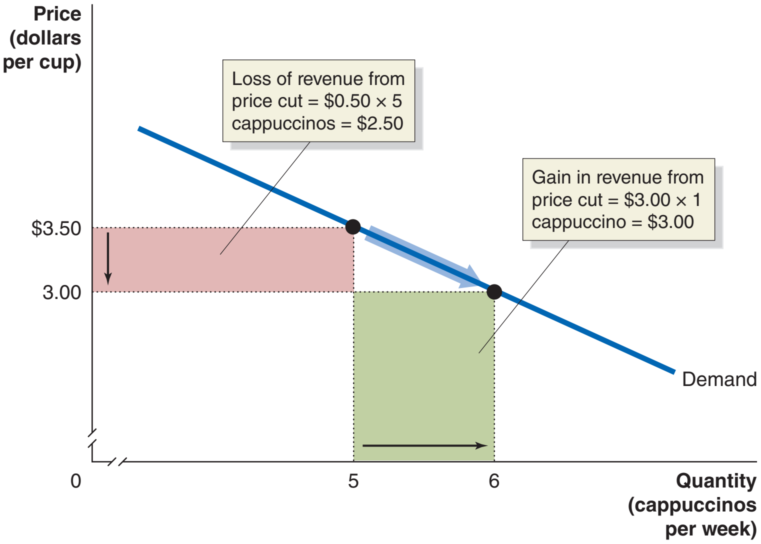
Demand and Marginal Revenue at a Blue Bottle Coffeehouse

Cappuccinos Sold per Week (Q)	Price (P)	Total Revenue ($TR = P \times Q$)	Average Revenue $\left(AR = \frac{TR}{Q}\right)$	Marginal Revenue $\left(MR = \frac{\Delta TR}{\Delta Q}\right)$
0	\$6.00	\$0.00	—	—
1	5.50	5.50	\$5.50	\$5.50
2	5.00	10.00	5.00	4.50
3	4.50	13.50	4.50	3.50
4	4.00	16.00	4.00	2.50
5	3.50	17.50	3.50	1.50
6	3.00	18.00	3.00	0.50
7	2.50	17.50	2.50	−0.50
8	2.00	16.00	2.00	−1.50
9	1.50	13.50	1.50	−2.50
10	1.00	10.00	1.00	−3.50

Figure 13.2

How a Price Cut Affects a Firm's Revenue

If a local Blue Bottle coffeehouse reduces the price of a cappuccino from \$3.50 to \$3.00, the number of cappuccinos consumers demand per week will increase from 5 to 6. The coffeehouse's marginal revenue from selling the sixth cappuccino will be \$0.50, which is equal to the \$3.00 additional revenue from selling 1 more cappuccino (the area of the green rectangle) minus the \$2.50 loss in revenue from selling the first 5 cappuccinos for \$0.50 less each (the area of the red rectangle).



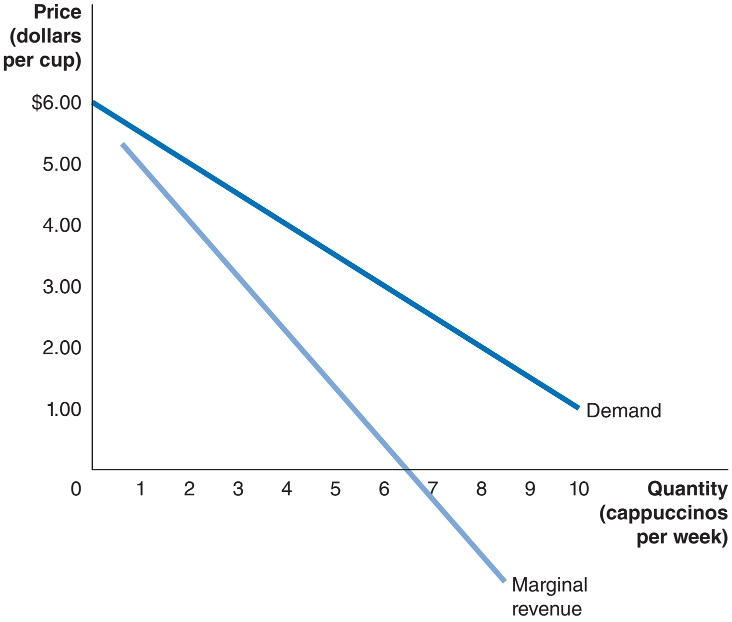
marginal revenue of the sixth cappuccino is far below its price of \$3.00. In fact, for each additional cappuccino that this Blue Bottle coffeehouse sells, marginal revenue will be less than price. There is an important general point: *Every firm that has the ability to affect the price of the good or service it sells will have a marginal revenue curve that is below its demand curve*. Only firms in perfectly competitive markets, which can sell as many units as they want at the market price, have marginal revenue curves that are the same as their demand curves.

Figure 13.3 plots the data from Table 13.1 and shows the relationship between the demand curve and the marginal revenue curve for your local Blue Bottle. Notice that after the sixth cappuccino, marginal revenue becomes negative because the additional revenue received from selling 1 more cappuccino is less than the revenue lost from receiving a lower price on the cappuccinos that could have been sold at the original price.

Figure 13.3

The Demand and Marginal Revenue Curves for a Monopolistically Competitive Firm

Any firm that has the ability to affect the price of the product it sells will have a marginal revenue curve that is below its demand curve. We plot the data from Table 13.1 to create the demand and marginal revenue curves for a Blue Bottle coffeehouse. After the sixth cappuccino, marginal revenue becomes negative because the additional revenue received from selling 1 more cappuccino is less than the revenue lost from receiving a lower price on the cappuccinos that could have been sold at the original price.



13.2 How a Monopolistically Competitive Firm Maximizes Profit in the Short Run

LEARNING OBJECTIVE: Explain how a monopolistically competitive firm maximizes profit in the short run.

All firms use the same approach to maximize profit: They produce the quantity where marginal revenue is equal to marginal cost. So the local Blue Bottle will maximize profit by selling the quantity of cappuccinos for which the last one sold adds the same amount to the firm's revenue as to its costs. (We want to keep this example simple in order to focus on the main points, so we are ignoring the other food and drinks, apart from cappuccinos, that this Blue Bottle sells.) Let's look more carefully at how monopolistically competitive firms maximize profit by considering the situation your local Blue Bottle faces in the short run. Recall that in the short run, at least one factor of production is fixed, and there is not enough time for new firms to enter the market (see Chapter 11, Section 11.2). A coffeehouse has many costs, including the cost of purchasing coffee beans and the ingredients for its other menu items, the electricity it uses, and the wages of its employees. Recall that a firm's *marginal cost* is the increase in total cost resulting from producing one more unit of output. We have seen that for many firms, the marginal cost curve has a U shape, and we will assume that it is true for this Blue Bottle.

We combine the revenue data from Table 13.1 with cost data to create the table in Figure 13.4 and plot the data from the table in the two graphs. In panel (a), we see how this Blue Bottle can determine its profit-maximizing quantity and price. As long as the marginal cost of selling 1 more cappuccino is less than the marginal revenue, the firm should make and sell additional cappuccinos. For example, increasing the quantity of cappuccinos sold from 3 per week to 4 per week increases cost by $1.00 but increases revenue by $2.50. So, this Blue Bottle coffeehouse's profit is increased by $1.50 as a result of selling the fourth cappuccino.

As this coffeehouse sells more cappuccinos, rising marginal cost eventually equals marginal revenue, and the firm sells the profit-maximizing quantity of cappuccinos. Marginal cost equals marginal revenue with the fifth cappuccino, which adds $1.50 to the firm's costs and $1.50 to its revenues—point *A* in panel (a) of Figure 13.4. The demand curve tells us the price at which the firm is able to sell 5 cappuccinos per week. In Figure 13.4, if we draw a vertical line from 5 cappuccinos up to the demand curve, we can see that the price at which the firm can sell 5 cappuccinos per week is $3.50 (point *B*). We can conclude that for this Blue Bottle, the profit-maximizing quantity is 5 cappuccinos, and the profit-maximizing price is $3.50. If the firm sells more than 5 cappuccinos per week, its profit will fall. For example, selling a sixth cappuccino adds $2.00 to its costs and only $0.50 to its revenues. So, its profit will fall from $5.00 to $3.50.

Panel (b) adds the average total cost curve for this Blue Bottle. The panel shows that the average total cost of selling 5 cappuccinos is $2.50. Recall from Chapter 12, Section 12.3 that:

$$\text{Profit} = (P - ATC) \times Q.$$

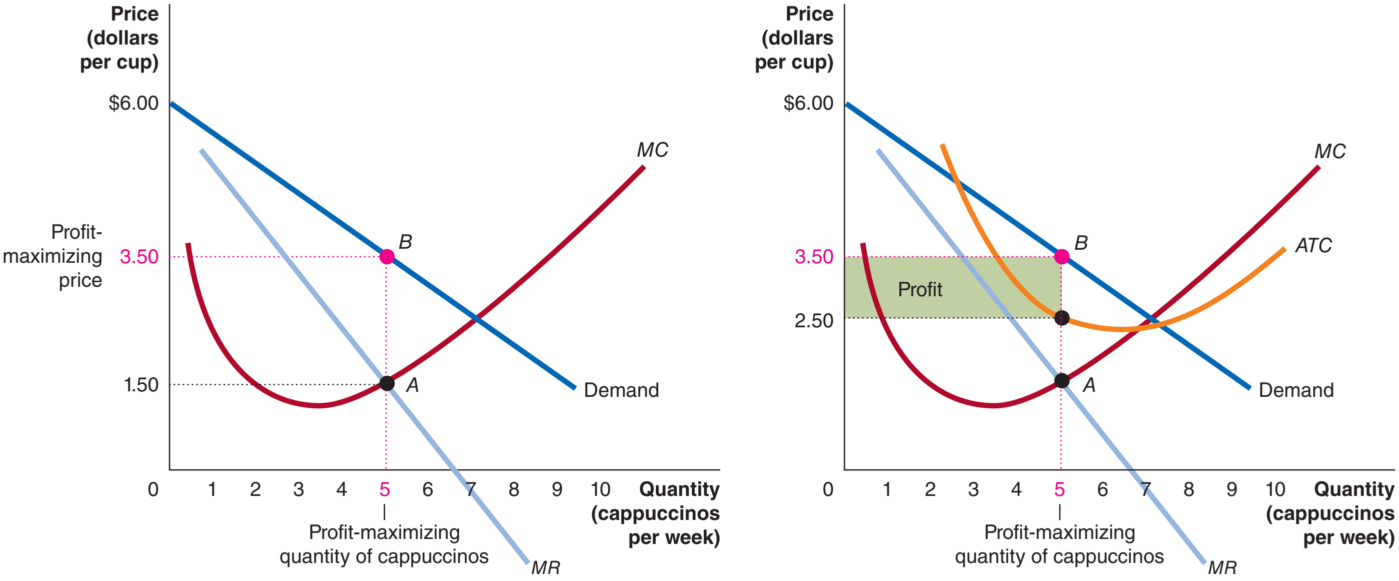
In this case:

$$\text{Profit} = (\$3.50 - \$2.50) \times 5 = \$5.00.$$

The green rectangle in panel (b) of Figure 13.4 shows the amount of profit. The rectangle has a base equal to Q and a height equal to $(P - ATC)$, so we know that its area equals profit.

Notice that, unlike a perfectly competitive firm, which produces where $P = MC$, a monopolistically competitive firm produces where $P > MC$. This Blue Bottle charges a price of $3.50, although marginal cost is $1.50. For a perfectly competitive firm, price equals marginal revenue, $P = MR$. Therefore, to fulfill the $MR = MC$ condition for profit maximization, a perfectly competitive firm will produce where $P = MC$.

Cappuccinos Sold per Week (*Q*)	Price (*P*)	Total Revenue (*TR*)	Marginal Revenue (*MR*)	Total Cost (*TC*)	Marginal Cost (*MC*)	Average Total Cost (*ATC*)	Profit
0	$6.00	$0.00	—	$5.00	—	—	–$5.00
1	5.50	5.50	$5.50	8.00	$3.00	$8.00	–2.50
2	5.00	10.00	4.50	9.50	1.50	4.75	0.50
3	4.50	13.50	3.50	10.00	0.50	3.33	3.50
4	4.00	16.00	2.50	11.00	1.00	2.75	5.00
5	3.50	17.50	1.50	12.50	1.50	2.50	5.00
6	3.00	18.00	0.50	14.50	2.00	2.42	3.50
7	2.50	17.50	–0.50	17.00	2.50	2.43	0.50
8	2.00	16.00	–1.50	20.00	3.00	2.50	–4.00
9	1.50	13.50	–2.50	23.50	3.50	2.61	–10.00
10	1.00	10.00	–3.50	27.50	4.00	2.75	–17.50



(a) Profit-maximizing quantity and price for a monopolistic competitor

(b) Short-run profits for a monopolistic competitor

Figure 13.4 **Maximizing Profit in a Monopolistically Competitive Market**

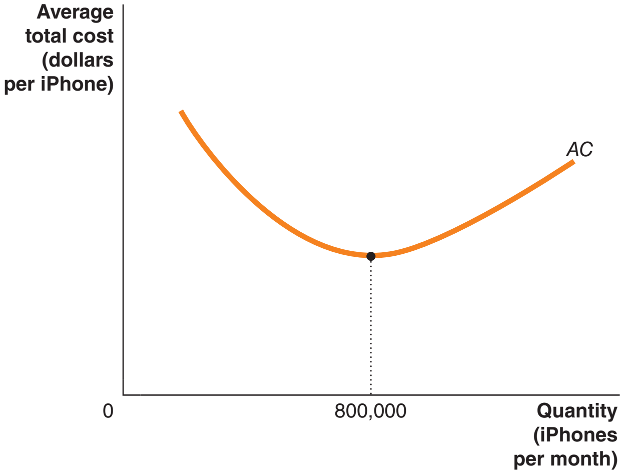
To maximize profit, a Blue Bottle coffeehouse needs to sell cappuccinos up to the point where the marginal revenue from selling the last cappuccino is just equal to its marginal cost. As the table shows, selling the fifth cappuccino—point *A* in panel (a)—adds $1.50 to the firm's costs and $1.50 to its revenues. The firm then uses the demand curve to find the price that will lead consumers to buy this quantity of cappuccinos (point *B*). In panel (b), the green rectangle represents the firm's profit. The rectangle has a height equal to $1.00, which is the $3.50 price minus the average total cost of $2.50, and it has a base equal to the quantity of 5 cappuccinos. So, for this coffeehouse, profit equals $1 × 5 = $5.00.

We know that $P > MR$ for a monopolistically competitive firm because the firm's marginal revenue curve is below its demand curve. Therefore, a monopolistically competitive firm will maximize profit by producing where $P > MC$.

Solved Problem 13.2

Does Minimizing Cost Maximize Profit at Apple?

Suppose Apple finds that the relationship between the average total cost of producing iPhones and the quantity of iPhones produced is as shown in the following graph. Will Apple maximize profit if it produces 800,000 iPhones per month? Briefly explain.

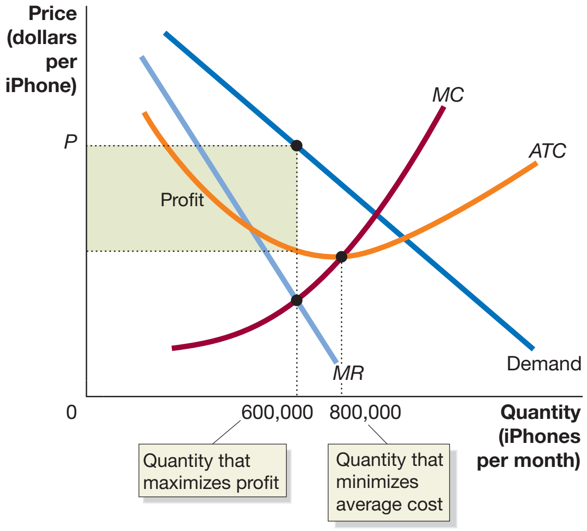


Solving the Problem

Step 1: **Review the chapter material.** This problem is about how monopolistically competitive firms maximize profit, so you may want to review the section "How a Monopolistically Competitive Firm Maximizes Profit in the Short Run."

Step 2: **Discuss the relationship between minimizing cost and maximizing profit.** Firms often talk about the steps they take to reduce costs. The graph in the problem shows that by producing 800,000 iPhones per month, Apple will minimize its average cost of production. But remember that minimizing cost is not the firm's ultimate goal; the firm's ultimate goal is to maximize profit. Depending on demand, a firm may maximize profit by producing a quantity that is either larger or smaller than the quantity that would minimize average total cost.

Step 3: **Draw a graph that shows Apple maximizing profit at a quantity where average cost is not minimized.** Your graph should be like the one below, which shows that although average total cost reaches a minimum at a quantity of 800,000, profit is maximized at a quantity of 600,000.



Your Turn: For more practice, do related problem 2.6 at the end of this chapter.

13.3 What Happens to Profits in the Long Run?

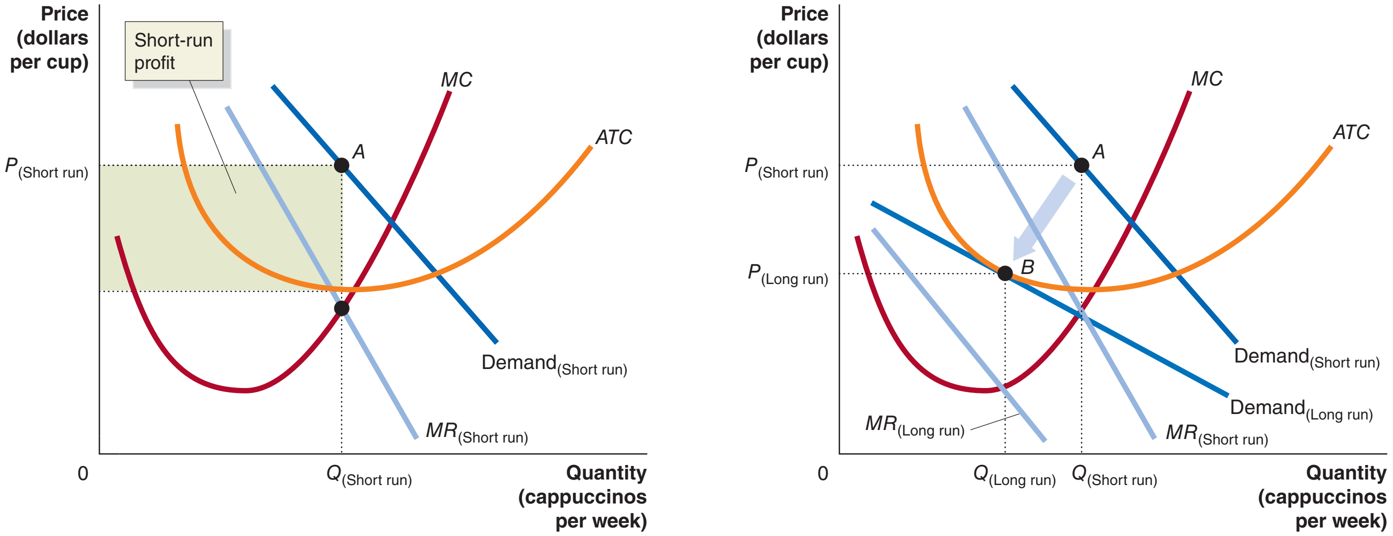
LEARNING OBJECTIVE: Analyze the situation of a monopolistically competitive firm in the long run.

Remember that a firm makes an economic profit when its total revenue is greater than all of its costs, including the opportunity cost of the funds invested in the firm by its owners. Because cost curves include the owners' opportunity costs, the Blue Bottle coffeehouse represented in Figure 13.4 is making an economic profit. This economic profit gives other entrepreneurs an incentive to enter this market and establish new firms. If a Blue Bottle coffeehouse is earning an economic profit selling cappuccinos, new coffeehouses are likely to open in the same area.

How Does the Entry of New Firms Affect the Profits of Existing Firms?

As new coffeehouses open near your local Blue Bottle coffeehouse, the firm's demand curve will shift to the left. The demand curve will shift because the Blue Bottle will sell fewer cappuccinos at each price when there are additional coffeehouses in the area. The demand curve will also become more elastic because consumers have additional coffeehouses from which to buy cappuccinos, therefore the Blue Bottle will lose more sales if it raises its prices. Figure 13.5 shows how the demand curve for your local Blue Bottle shifts as new coffeehouses enter its market.

In panel (a) of Figure 13.5, the short-run demand curve shows the relationship between the price of cappuccinos and the quantity of cappuccinos this Blue Bottle sells per week before the entry of new firms. With this demand curve, this Blue Bottle can charge a price above average total cost—shown as point A in panel (a)—and make a profit. But this profit attracts additional coffeehouses to the area and shifts the demand curve for this Blue Bottle's cappuccinos to the left. As long as this Blue Bottle is making an economic profit, there is an incentive for additional coffeehouses to open in the area and sell cappuccinos, and the demand curve will continue shifting to the left. As panel (b) shows, the entry of new firms will shift the demand curve to the point where it is just touching—or tangent to—the average total cost curve. Only then will the incentive for new coffeehouses to open in the area be eliminated.



(a) A monopolistic competitor may earn a short-run profit

(b) A monopolistic competitor's profit is eliminated in the long run

Figure 13.5 **How Entry of New Firms Eliminates Profit**

Panel (a) shows that in the short run, your local Blue Bottle coffeehouse faces the demand and marginal revenue curves labeled "Short run." With this demand curve, the coffeehouse can charge a price above average total cost (point *A*) and make a profit, shown by the green rectangle. But this profit attracts new firms to enter the market, which shifts the demand and marginal revenue curves to the curves labeled "Long run" in panel (b). Because price is now equal to average total cost (point *B*), the coffeehouse breaks even and no longer earns an economic profit.

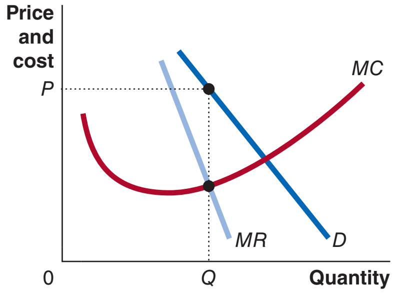
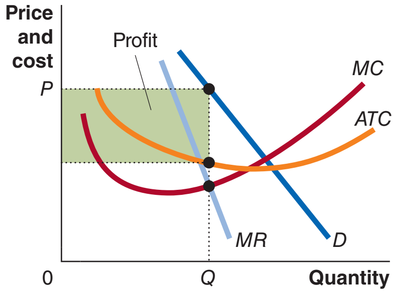
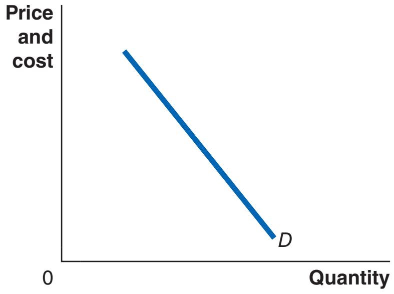
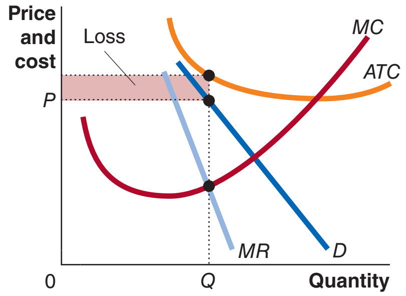
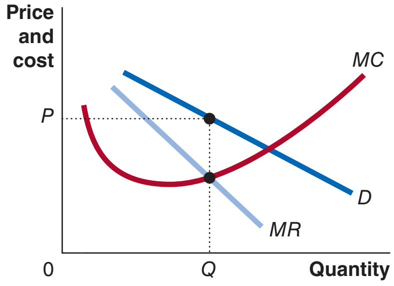
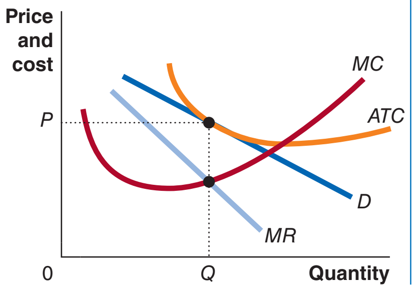
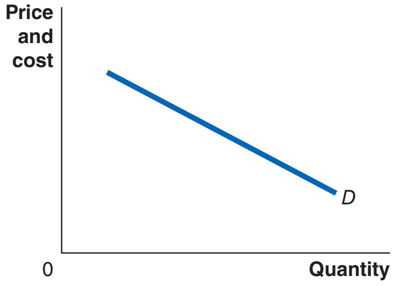
In the long run, at the point where the demand curve is tangent to the average total cost curve, price is equal to average total cost (point *B*), the firm is breaking even, and the firm no longer earns an economic profit. In the long run, the demand curve is also more elastic because the more coffeehouses there are in the area, the more sales this Blue Bottle will lose to other coffeehouses if it raises its price.

Of course, it is possible that a monopolistically competitive firm will suffer an economic loss in the short run. As a consequence, the owners of the firm will not be covering the opportunity cost of their investment. We expect that, in the long run, firms will exit an industry if they are suffering an economic loss. If firms exit, the demand curve for the output of a remaining firm will shift to the right. This process will continue until the representative firm in the industry is able to charge a price equal to its average total cost and break even. Therefore, in the long run, monopolistically competitive firms will experience neither an economic profit nor an economic loss.

Table 13.2 summarizes the short run and the long run for a representative monopolistically competitive firm. In the first column we can see that in both the short run

Table 13.2

The Short Run and the Long Run for a Monopolistically Competitive Firm

Profit-Maximizing Price and Quantity	Profit and Loss	Elasticity of Demand Curve
Short Run *P* > *MC* 	**Short Run** Economic profit 	**Short Run (less competition)** Less elastic demand curve 
	or Economic loss 	
Long Run *P* > *MC* 	**Long Run** Zero economic profit 	**Long Run (more competition)** More elastic demand curve 

and the long run, a firm will produce the quantity for which marginal cost equals marginal revenue.

In both the short run and the long run, price is greater than marginal cost. In the second column, we add the average total cost (*ATC*) curve to the graphs to show the firm's profit or loss. In the short run, the firm will make a profit if *P* is greater than *ATC* or a loss if *P* is less than *ATC*. In the long run, entry or exit of firms will eliminate profit or loss, and the firm will just break even, as shown in the bottom row. The final column shows that the firm is likely to have a less elastic demand curve in the short run because it faces less competition, and it is likely to have a more elastic demand curve in the long run, when it faces more competition as new firms enter the industry.

Don't Let This Happen to You

Don't Confuse Zero Economic Profit with Zero Accounting Profit

Remember that economists count the opportunity cost of an owner's investment in her firm as a cost. Suppose you invest $200,000 opening a pizza restaurant, and the return you could earn on those funds each year in a similar investment—such as opening a coffeehouse—is 10 percent. Therefore, the annual opportunity cost of investing the funds in your own business is 10 percent of $200,000, or $20,000.

Suppose that at the end of the year, your restaurant has revenue of $250,000, and all of your other costs, *apart from the opportunity cost of your investment in your restaurant*, equal $230,000. In an accounting sense, your profit would be $20,000, and that is the amount you would have to pay taxes on. But in an economic sense, we need to include the opportunity cost of investing $200,000 in your own restaurant, which means that you are actually just breaking even. We would expect that in long-run equilibrium, the entry of new firms would keep you from earning more than 10 percent on your investment, which is just the return needed for you to break even and earn zero economic profit.

Your Turn: Test your understanding by doing related problem 3.9 at the end of this chapter.

Apply the Concept

Can Third Wave Coffeehouses Remain Profitable?

Jamie Pham/Alamy Stock Photo

Intelligentsia Coffee is a third wave coffee chain that opened in 1995. Peet's Coffee purchased the chain in 2015.

In the 1980s, the success of the Starbucks coffeehouse chain surprised many people. After all, consumers in the United States had seemed satisfied with the coffee served in diners and restaurants or that they brewed at home. As we saw in the chapter opener, when Howard Schultz joined Starbucks in 1982, he realized that many consumers wanted to drink higher-quality coffee in an environment where they could relax, read, and chat.

But it didn't take long for other coffeehouse chains to copy the Starbucks approach. In recent years, entrepreneurs have realized that it will be difficult to earn an economic profit by opening coffeehouses that copy Starbucks. Owners of third wave coffeehouses have taken a different approach. In 1995, Emily Mange and Doug Zell helped launch third wave coffee when they opened Intelligentsia, a small chain of coffeehouses based in Chicago. Like other third wave coffeehouses, Intelligentsia buys coffee beans directly from coffee growers rather than from wholesalers. Alyza Bohbot, who owns City Girl Coffee, headquartered in Duluth, Minnesota, sources only from farms owned by women in the developing world. She argues that direct trade is particularly appealing to millennials: "As a group they're much more conscientious about what they're purchasing and from whom."

Generally, these third wave coffeehouses attempt to differentiate their products in two ways:

1. They typically sell higher-end, or *artisanal*, coffee. They often prepare the coffee in ways that cost more, as Blue Bottle does in using a pour-over brewing method to make individual servings. As one industry observer noted, "They can't just churn out a million cups of coffee a day and make it by the vat."
2. These coffeehouses directly source their coffee from growers instead of relying on coffee wholesalers. Doing so gives them greater control over the types of coffee beans they purchase and, they generally claim, results in growers earning more than they would by selling to wholesalers.

The approach that third wave coffeehouses take is similar to the approach that farmers selling cage-free eggs take. (See the discussion of cage-free eggs in Chapter 12.) In both cases, firms are appealing to a particular segment of the market that they believe existing firms are not serving. Just as cage-free eggs appeal to consumers concerned about humane treatment of chickens, third wave coffee appeals to consumers concerned about fair treatment of coffee growers in the developing world. In both cases, firms are using methods that involve higher production costs and are charging consumers higher prices.

Can third wave coffeehouses continue to earn an economic profit? We've seen that over time, firms that earn an economic profit attract the entry of new firms that try to copy their approach, and this competition eventually forces prices down until they are equal to average total cost. Artisanal methods of preparing coffee, such as pour-over brewing, can be easily copied by other coffeehouses. Locating coffee growers in foreign countries and negotiating contracts with them is time-consuming and costly, but we would expect other firms to copy this approach as well if it allowed them to earn an economic profit. The process of entry is speeded up if the new entrants are already large firms. We noted previously that Blue Bottle Coffee started as a single coffeehouse in Oakland, California, and was acquired in 2017 by the large Swiss food firm Nestlé. Similarly, Peet's Coffee, which is one of the main competitors of Starbucks, acquired third wave coffeehouse chain Intelligentsia in 2015.

Third wave coffeehouses have also begun to experience competition from craft breweries. These breweries typically make most of their sales in the evenings, when people are more likely to consume alcohol. By offering coffee, breweries are able to increase their business during the day. An article in the *Wall Street Journal* quoted the owner of one craft brewery as saying: "If you're paying rent, why not have something in-house that makes money during the day, not just at night like most brewpubs?" Because many people who like craft beer also like artisanal coffee, craft breweries can be in direct competition with third wave coffeehouses.

Some third wave coffeehouses have responded to increased competition by expanding the types of coffees they offer. For instance, in 2023, Blue Bottle Coffee began selling coffee brewed from Robusta coffee beans. Many coffeehouses, including Starbucks, had avoided using this type of bean because some people find that coffee brewed from it is too bitter. But other consumers like it. As the founder of Nguyen Coffee Supply put it, "I feel like definitely the tide has turned, and now Robusta is the coolest bean on the block."

But, again, there is no reason that Starbucks—or any other coffeehouse—can't eventually begin offering coffee brewed from Robusta beans. We can conclude that there is no clear reason to expect that third wave coffeehouses can avoid the fate of most firms that find innovative ways to earn an economic profit: Over time, entry of new firms using similar approaches will compete away the profit.

Your Turn: Test your understanding by doing related problem 3.11 at the end of this chapter.

Is Zero Economic Profit Inevitable in the Long Run?

The key to earning an economic profit is either to sell a differentiated product or to find a way of producing an existing product at a lower cost. If a monopolistically competitive firm selling a differentiated product is earning an economic profit, the profit will attract the entry of additional firms, and the entry of those firms will eventually eliminate the firm's profit. If a firm introduces new technology that allows it to sell a good or service at a lower cost, competing firms will eventually duplicate that technology and eliminate the firm's profit. *But this result holds only if the firm stands still and fails to find new ways of differentiating its product or fails to find new ways of lowering the cost of producing its product.*

The owner of a competitive firm is in a position like that of Ebenezer Scrooge in Charles Dickens's *A Christmas Carol*. When the Ghost of Christmas Yet to Come shows Scrooge visions of his own death, he asks the ghost, "Are these the shadows of the things that Will be, or are they shadows of things that May be, only?" The shadow of the end of their profits haunts owners of every firm. Firms try to continue earning a profit by reducing costs, by improving their products, by providing exceptional customer service, or by convincing consumers that their products are indeed different from what competitors offer. To stay one step ahead of its competitors, a firm has to offer consumers goods or services that they perceive to have greater *value* than those that competing firms offer. Value can take the form of product differentiation that makes the good or service more suited to consumers' preferences, or it can take the form of a lower price.

Solved Problem 13.3

Reducing "Last-Mile" Costs at Target

Speedy delivery is a key advantage that Amazon has over many other online sellers. Those sellers struggle to compete with Amazon's network of warehouses, which allow it to provide one-day delivery of many products. In 2023, Target Corporation announced that it would build "sortation centers" to reduce the cost of delivering goods, such as microwave ovens, directly to consumers' homes. Gretchen McCarthy, Target's chief global supply chain and logistics officer, was quoted as saying, "Through our sortation centers and Target last-mile delivery capabilities, we're able to move faster and with more precision—while controlling costs and expanding our network capacity." Suppose that these sortation centers are successful in reducing the fixed cost of operating Target's business but that the new centers don't affect the marginal cost of selling products or the demand for the products.

a. Draw a graph similar to panel (a) of Figure 13.5 to show how building sortation centers affects Target's profit. Your graph should indicate whether any curves have shifted. Your graph should also show any changes in the store's profit-maximizing price and quantity and any change in the area representing the store's profit. Assume for simplicity that microwave ovens are the only product Target sells.

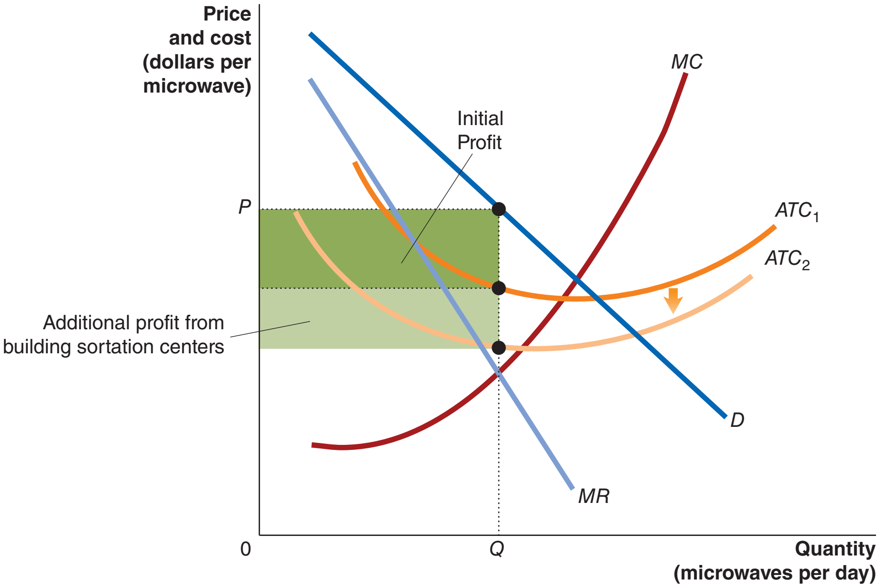
b. Would we expect that Target's strategy of building sortation centers will allow it to earn an economic profit in the long run? Briefly explain.

Solving the Problem

Step 1: **Review the chapter material.** This problem is about the long run for a monopolistically competitive firm, so you may want to review the section "What Happens to Profits in the Long Run?"

Step 2: **Answer part (a) by drawing a graph like panel (a) of Figure 13.5 and show on the graph how building sortation centers affects Target's profit.** Recall that a firm's fixed cost is included in its total cost. Because Target's fixed cost has declined, so has its average total cost. Therefore, your graph should show the *ATC* curve shifting down, from ATC_1 to ATC_2. The *MC* curve should be unchanged because it isn't affected by changes in fixed cost. Because demand is unchanged, the marginal revenue curve, *MR*, is unchanged. With unchanged *MC* and *MR* curves, the profit-maximizing quantity, *Q*, and the profit-maximizing price, *P*, will also be unchanged. The area representing Target's profit with ATC_1 is shown here in dark green. The *additional* profit Target earns after the *ATC* curve shifts down to ATC_2 is shown in light green.

Target's total profit after the *ATC* curve shifts down equals the sum of the dark green and light green areas.



Step 3: **Answer part (b) by explaining whether it's likely that Target's sortation centers will allow it to earn an economic profit in the long run.** We've seen that when a firm earns an economic profit, other firms have an incentive to copy its approach. In the long run, we would expect that Target's economic profit will be competed away, although it can postpone this result by adopting new strategies, like building sortation centers. So Target's strategy of building sortation centers may allow it to increase its economic profit in the short run, but in the long run, other online sellers can copy the approach and compete away Target's economic profit.

Your Turn: For more practice, do related problem 3.12 at the end of this chapter.

13.4 Comparing Monopolistic Competition and Perfect Competition

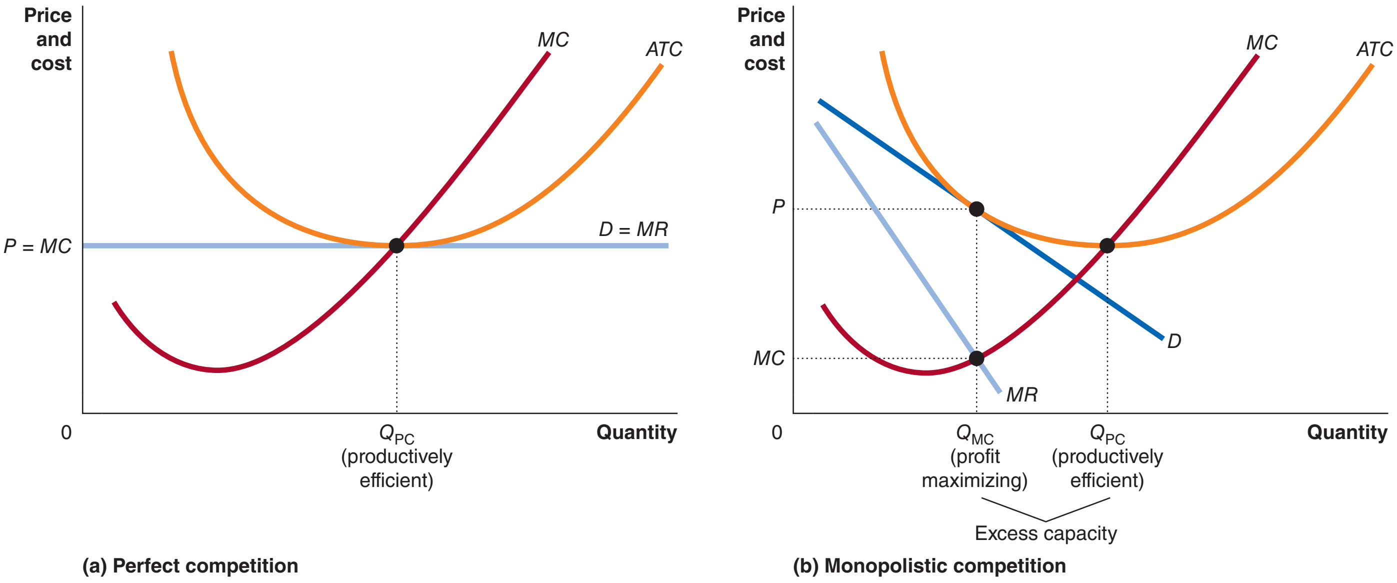
LEARNING OBJECTIVE: Compare the efficiency of monopolistic competition and perfect competition.

We have seen that monopolistic competition and perfect competition share the characteristic that in long-run equilibrium, firms earn zero economic profit. As Figure 13.6 shows, however, there are two important differences between long-run equilibrium in the two markets:

- Monopolistically competitive firms charge a price greater than marginal cost.
- Monopolistically competitive firms do not produce at minimum average total cost.

Excess Capacity under Monopolistic Competition

Recall that a firm in a perfectly competitive market faces a perfectly elastic demand curve that is also its marginal revenue curve. Therefore, the firm maximizes profit by producing the quantity where price equals marginal cost. As panel (a) of Figure 13.6 shows, in long-run equilibrium, a perfectly competitive firm produces at the minimum point of its average total cost curve.



(a) Perfect competition

(b) Monopolistic competition

Figure 13.6 **Comparing Long-Run Equilibrium under Perfect Competition and Monopolistic Competition**

In panel (a), a perfectly competitive firm in long-run equilibrium produces at Q_{PC}, where price equals marginal cost, and average total cost is at a minimum. The perfectly competitive firm is both allocatively efficient and productively efficient. In panel (b), a monopolistically competitive firm produces at Q_{MC}, where price is greater than marginal cost, and average total cost is not at a minimum. As a result, the monopolistically competitive firm is neither allocatively efficient nor productively efficient. The monopolistically competitive firm has excess capacity equal to the difference between its profit-maximizing level of output and the productively efficient level of output.

Panel (b) of Figure 13.6 shows that the profit-maximizing level of output for a monopolistically competitive firm comes at a level of output where price is greater than marginal cost, and the firm is not at the minimum point of its average total cost curve. A monopolistically competitive firm has *excess capacity*: If it increased its output, it could produce at a lower average total cost.

Is Monopolistic Competition Inefficient?

We previously discussed the difference between productive efficiency and allocative efficiency (see Chapter 12, Section 12.6):

- *Productive efficiency* refers to the situation in which a good is produced at the lowest possible cost. For productive efficiency to hold, firms must produce at the minimum point of the average total cost curve.
- *Allocative efficiency* refers to the situation in which every good or service is produced up to the point where the last unit provides a marginal benefit to consumers equal to the marginal cost of producing it. For allocative efficiency to hold, firms must charge a price equal to marginal cost.

In a perfectly competitive market, both productive efficiency and allocative efficiency are achieved, but in a monopolistically competitive market, neither is achieved. Does it matter? Economists have debated whether monopolistically competitive markets being neither productively efficient nor allocatively efficient results in a significant loss of well-being to society in these markets compared with perfectly competitive markets.

How Consumers Benefit from Monopolistic Competition

Looking again at Figure 13.6, you can see that the key difference between the monopolistically competitive firm and the perfectly competitive firm is that the demand curve for the monopolistically competitive firm slopes downward, while the demand curve for the perfectly competitive firm is a horizontal line. The demand curve for the monopolistically competitive firm slopes downward because the good or service the firm is selling is differentiated from goods or services being sold by competing firms. The perfectly competitive firm is selling a good or service identical to those being sold by its competitors. Remember that *firms differentiate their products to appeal to consumers*. For example, when Walmart begins selling Mash-Up organic ground coffee, when Apple begins selling smartphones with larger screens, when General Mills introduces Apple Cinnamon Cheerios, or when PepsiCo introduces Diet Pepsi Wild Cherry, they are all attempting to attract and retain consumers through product differentiation. The success of these product differentiation strategies indicates that some consumers find these products preferable to the alternatives. Consumers, therefore, are better off than they would have been had these companies not differentiated their products.

We can conclude that consumers face a trade-off when buying the product of a monopolistically competitive firm: They are paying a price that is greater than marginal cost, and the product is not being produced at minimum average cost, but they benefit from being able to purchase a product that is differentiated and more closely suited to their tastes.

Apply the Concept

Can sweetgreen Earn an Economic Profit Selling Fast Food to Millennials and Gen Zs?

sweetgreen
Newsstand

Robert K. Chin - Storefronts/Alamy Stock Photo

Will fresh ingredients and a food-ordering app help sweetgreen differentiate itself from competitors and earn a profit?

As we've seen, intense competition among firms in monopolistically competitive industries leads entrepreneurs to continually search for new ways of differentiating products. One way to differentiate yourself from the competition is to anticipate changes in consumers' tastes and to adapt existing products or develop new products to fit those changed tastes. As we saw in Chapter 3, Section 3.1, millennials (born between 1981 and 1996) and members of generation Z (born between 1997 and 2012) often have different tastes than do members of older generations.

As seniors at Georgetown University, Jonathan Neman, Nicolas Jammet, and Nathaniel Ru were dissatisfied with the fast-food options available around the campus. In 2007, they opened a small restaurant called sweetgreen that served salads made from organic ingredients. By 2023, sweetgreen had expanded to more than 150 restaurants around the country. According to the company, their goal is to offer "plant-forward, seasonal, and earth-friendly meals from fresh ingredients and produce that prioritizes organic, regenerative, and local sourcing." This approach is intended to appeal to millennials and members of generation Z who want a fast-food alternative to burgers or pizzas. In addition, the founders enabled customers to order using either the restaurant's app or third-party food delivery apps, such as DoorDash or Uber Eats. Customers ordering on the sweetgreen app have their ordering history reflected in the suggested selections. In 2023, sweetgreen's chief brand officer Ru explained the selections this way: "If you don't like meat and are gluten-intolerant, we want to make sure they don't show up on your app." As much as 75 percent of sweetgreen's sales come from orders placed through an app—an unusually high percentage for a fast-food restaurant.

The combination of products aimed primarily at consumers younger than 40 and heavy use of technology led some investors to believe that sweetgreen would be very profitable. At its initial public offering on the New York Stock Exchange in November 2021, the firm's stock had a price of $28 per share, which soared to $52 per share at the end of the first day of trading. Unfortunately for investors who bought shares at those prices, sweetgreen's stock had fallen to $12 per share in September 2023. The falling stock price reflected the fact that sweetgreen had yet to have a profitable year.

Like other restaurants, sweetgreen suffered from a decline in sales during the Covid–19 pandemic. Because many sweetgreen restaurants are located in the business districts of large cities, they were hurt by an increase in people working from home. Sales of "desk salads"—salads that office workers order delivered to their desks—declined.

But as sweetgreen's losses persisted into 2023, some industry analysts questioned whether their differentiation strategy would ever succeed in being profitable.

sweetgreen's differentiation strategy was similar to the strategy of farmers switching to selling pasture-raised eggs, as we discussed in the chapter opener to Chapter 12, or opening third wave coffeehouses, as we discussed in this chapter. In all these cases, differentiation involved offering products with higher costs. The locally sourced, organic food sweetgreen serves can only be economically profitable at prices higher than the prices other restaurants charge for salads. At least through late 2023, it didn't appear that enough customers valued the types of ingredients sweetgreen uses in its salads enough to pay a premium for them. sweetgreen's technology—primarily a sophisticated ordering app—also didn't seem sufficiently attractive to cause enough consumers to switch from ordering from other restaurants.

Although the entrepreneurs who founded sweetgreen may still manage to find enough customers to allow them to at least break even, in late 2023, the restaurant chain appeared to be a failed attempt at product differentiation.

Your Turn: Test your understanding by doing related problem 4.7 at the end of this chapter.

13.5 How Marketing Differentiates Products

LEARNING OBJECTIVE: Define marketing and explain how firms use it to differentiate their products.

Marketing All the activities necessary for a firm to sell a product to a consumer.

Firms can differentiate their products through **marketing**, which refers to all the activities necessary for a firm to sell a product to a consumer. Marketing includes determining which product to sell, designing the product, advertising the product, deciding how to distribute the product—for example, in retail stores or online—and monitoring how changes in consumer tastes are affecting the market for the product. The late Peter F. Drucker, a leading business strategist, described marketing as follows: "It is the whole business seen from the point of view of its final result, that is, from the consumer's point of view. . . . True marketing . . . does not ask, 'What do we want to sell?' It asks, 'What does the consumer want to buy?'"

For monopolistically competitive firms to earn an economic profit and defend the profit from competitors, they must differentiate their products. Firms use two marketing tools to differentiate their products: brand management and advertising.

Brand Management

Brand management The actions of a firm intended to maintain the differentiation of a product over time.

Once a firm has succeeded in differentiating its product, it must try to maintain that differentiation over time through **brand management**. As we have seen, whenever a firm successfully introduces a new product or a significantly different version of an old product, it earns an economic profit in the short run. But the success of the firm inspires competitors to copy the new or improved product, and, in the long run, the firm's economic profit will be competed away. Firms use brand management to postpone the time when they will no longer be able to earn an economic profit.

Advertising

An innovative advertising campaign can make even long-established and familiar products, such as Coke or McDonald's Big Mac hamburgers, seem more desirable than competing products. When a firm advertises a product, it is trying to shift the demand curve for the product to the right and to make it more inelastic. If the firm is successful, it will sell more of the product at every price, and it will be able to increase the price it charges without losing as many customers. Of course, advertising also increases a firm's costs. If the increase in revenue that results from the advertising is greater than the increase in costs, the firm's profit will increase.

Defending a Brand Name

To defend a brand name, a firm can apply to the federal government for a *trademark*, which grants legal protection against other firms using its product's name.

One threat to a trademarked name is the possibility that it will become so widely used for a type of product that it will no longer be associated with the product of a specific company. Courts in the United States have ruled that when this happens, a firm is no longer entitled to legal protection of the brand name. For example, "aspirin," "escalator," and "thermos" were originally all brand names of the products of particular firms, but each became so widely used to refer to a type of product that none remains a legally protected brand name. Firms spend substantial amounts trying to prevent this from happening. Coca-Cola, for example, employs people to travel to restaurants around the country and order a "Coke" with their meal. If the restaurant serves Pepsi or some other cola, rather than Coke, Coca-Cola's legal department sends the restaurant a letter reminding the owner that "Coke" is a trademarked name and not a generic name for any cola.

Legally enforcing trademarks can be difficult. Estimates are that each year, U.S. firms lose hundreds of billions of dollars in sales worldwide as a result of unauthorized use of their trademarked brand names. U.S. firms often find it difficult to enforce their trademarks in the courts of some foreign countries, although recent international agreements have increased the legal protections for trademarks.

Firms that sell their products through franchises rather than through company-owned stores encounter the problem that if a franchisee does not run his or her business well, the firm's brand may be damaged. Firms can take steps to keep such damage from happening. For example, automobile firms send agents to visit their dealers to make sure the dealerships are clean and well maintained and that the service departments employ competent mechanics and are well equipped with spare parts. Similarly, McDonald's sends employees from corporate headquarters to visit McDonald's franchises to make sure the bathrooms are clean and the French fries are hot.

13.6 What Makes a Firm Successful?

LEARNING OBJECTIVE: Identify the key factors that determine a firm's success.

A firm's owners and managers control some of the factors that make a firm successful and allow it to earn an economic profit. The most important of these is the firm's ability to differentiate its product or to produce it at a lower average cost than competing firms. A firm that successfully does one or both of these things creates *value* for its customers. Consumers will buy a product if they believe it meets a need not met by competing products or if its price is below that of competitors.

Some factors that affect a firm's profitability are not directly under the firm's control. Certain factors will affect all the firms in a market. For example, rising prices for jet fuel will reduce the profitability of all airlines. When many consumers decided that rather than buy DVDs, they preferred to stream movies from Netflix, iTunes, or Amazon, the profitability of all stores selling DVDs was reduced.

Unexpected changes in government policy can also affect a firm's profitability. Amazon is making a large investment in Amazon Go convenience stores. If you shop at one of these stores, you scan your smartphone as you enter the store. Cameras and sensors track your path through the store, and software records each item you take from the shelves. As you leave the store, your credit card is automatically charged for the purchases. These stores don't have any checkout lines, cash registers, or cashiers. Amazon is concerned that some cities have passed regulations requiring that all stores accept currency in payment for goods. If those regulations become widespread, Amazon will either have to abandon its investment in expanding Amazon Go stores or accept the higher costs (and lower profit) of accepting currency.

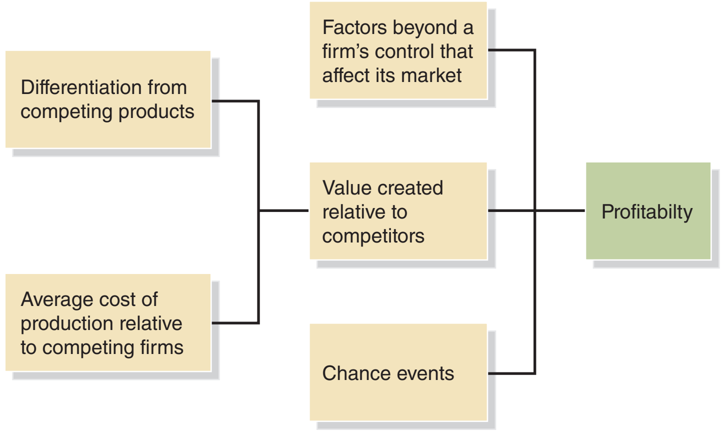

Factors beyond a firm's control that affect its market
Differentiation from competing products
Value created relative to competitors
Profitabilty
Average cost of production relative to competing firms
Chance events

Figure 13.7

What Makes a Firm Successful?

The factors under a firm's control—the ability to differentiate its product and the ability to produce it at lower cost—combine with factors beyond its control to determine the firm's profitability.

Adapted from Figure 9.2 in David Besanko, David Dranove, Mark Shanley, and Scott Schaefer, *The Economics of Strategy*, 7th ed., New York: John Wiley & Sons, Inc., 2017, p. 295.

Sheer chance also plays a role in business, as it does in all other aspects of life. A struggling McDonald's franchise may see its profit increase dramatically after the county unexpectedly decides to build a new road nearby. During 2020 and 2021, many small businesses, particularly restaurants, that had been successful, saw most of their customers and all of their profits disappear as state and local governments closed or reduced the capacity of these businesses to help lessen the spread of Covid. Figure 13.7 illustrates the important point that factors within a firm's control and factors outside a firm's control interact to determine its profitability.

Apply the Concept

Is Being the First Firm in the Market a Key to Success?

Gorodenkoff/Shutterstock

Which move will be more successful: Microsoft's decision to be the first to integrate chatbot software into its search engine or Alphabet's decision to take a more cautious approach?

Some business analysts argue that the first firm to enter a market can have important *first-mover advantages*. By being the first to sell a particular good, a firm may find its name closely associated with the good in the public's mind, as, for instance, Amazon is closely associated with online shopping and eBay is associated with online auctions. This close association may make it more difficult for new firms to enter the market and compete against the first mover.

Surprisingly, though, recent research has shown that the first firm to enter a market often does not have a long-lived advantage over later entrants. Consider the market for pens. Until the 1940s, the only pens available were fountain pens that had to be refilled frequently from an ink bottle and used ink that dried slowly and smeared easily. In October 1945, entrepreneur Milton Reynolds introduced the first ballpoint pen, which did not need to be refilled. When the pen went on sale at Gimbels department store in New York City, it was an instant success. Although the pen had a price of $12—the equivalent of about $165 at today's prices—hundreds of thousands were sold, and Milton Reynolds became a millionaire. Unfortunately, the success didn't last. Although Reynolds had guaranteed that his pens would write for two years—later raised to five years—in fact, the pens often leaked and frequently stopped writing after only limited use. Sales collapsed, and the flood of pens returned under the company's guarantee wiped out its profit. Within a few years, Reynolds International Pen Company stopped selling pens in the United States. By the late 1960s, firms such as Bic, selling inexpensive—but reliable—ballpoint pens, dominated the market.

What happened to the Reynolds International Pen Company turns out to be more the rule than the exception. For example:

- **Digital music players:** Apple's iPod was not the first digital music player to appear on the U.S. market. Both SaeHan's MPMan and Diamond's Rio PMP300 were released in the United States in 1998, three years before the iPod.

- **Smartphones:** The Japanese firm NTT DoCoMo introduced the first widely adopted smartphone in 1999, and BlackBerry introduced a smartphone in the United States shortly thereafter. By 2016, neither firm was still producing smartphones.
- **Printers:** Although Hewlett-Packard currently leads the market for printers, it didn't invent the printer. Xerox invented the laser printer, and IBM sold the first commercial laser printers, although neither firm is important in the market today.
- **Disposable diapers:** Procter & Gamble was not the first firm to sell disposable diapers when it introduced Pampers in 1961. Johnson & Johnson had introduced them in 1948.
- **Pizza chains:** Shakey's Pizza was the first franchised pizza chain in the United States, but it went into decline following competition from later entrants such as Domino's, Pizza Hut, and Little Caesars, which offered consumers lower prices and had more effective marketing.
- **Web browsers:** Google's Chrome was not the first web browser; before Chrome, there was Internet Explorer; before Internet Explorer, there was Netscape; before Netscape, there was Mosaic; and before Mosaic, there were several other web browsers that for a time looked as if they might dominate the market.
- **Smartwatches:** In 2004, Microsoft introduced the SPOT smartwatch, but the company discontinued it in 2008, when it failed to find many buyers.

OpenAI is an artificial intelligence (AI) startup headquartered in San Francisco. In November 2022, OpenAI released ChatGPT, a *generative AI program* capable of quickly composing sophisticated answers to most questions. Microsoft invested in OpenAI, and in 2023, Microsoft integrated a version of ChatGPT into its Bing search engine. In developing ChatGPT, OpenAI relied, in part, on AI software that Google had developed years before. In fact, as early as 2021, two of Google's software engineers had developed a chatbot that they urged the company to incorporate into Google's search engine. At that point, Sundar Pichai, CEO of Google's parent firm Alphabet, decided not to go forward with using the chatbot in Google's search engine. According to an article in the *Wall Street Journal*, Pichai later explained to Google employees that "some of the company's most successful products weren't the first to market but earned user trust over time." The article quoted him as telling employees: "The most important thing we can do right now is to focus on building a great product and developing it responsibly." Time will tell whether Microsoft's decision to be the first to integrate chatbot software with search or Google's more cautious approach will be more successful.

We can conclude that there are many cases in which the firms that were first to introduce a product ultimately lost out to other companies that arrived on the scene later but did a better job of providing consumers with products that were more reliable, less expensive, or more convenient or that otherwise provided greater value.

Your Turn: Test your understanding by doing related problems 6.6 and 6.7 at the end of this chapter.

Continued from chapter opener

Economics in Your Life & Career

Can You Operate a Successful Restaurant?

At the beginning of the chapter, we asked you to think about how successful you are likely to be in opening an Italian restaurant in your hometown. As you saw in this chapter, if your restaurant is successful, other people are likely to open competing restaurants, and all your economic profit will eventually disappear. Your new competitors will sell Italian food, but it won't be exactly like yours. Each restaurant will have its own ideas about how best to appeal to people who like Italian food. But unless your food is very different from your competitors' food—or your service is much better—in the long run, you will be unable to charge prices high enough to allow you to earn an economic profit.

In a monopolistically competitive market, free entry will reduce prices and lead to zero economic profit in the long run. In addition to lowering prices, competition benefits consumers by leading firms to offer somewhat different versions of the same product; for example, two Italian restaurants will rarely be exactly alike.

Conclusion

In this chapter, we applied to the more common market structure of monopolistic competition many of the ideas about competition we developed in discussing perfect competition. At the end of Chapter 12, we concluded: "The competitive forces of the market impose relentless pressure on firms to produce new and better goods and services at the lowest possible cost. Firms that fail to adequately anticipate changes in consumer tastes or that fail to adopt the latest and most efficient production technology do not survive in the long run." These conclusions are as true for coffeehouses and firms in other monopolistically competitive markets as they are for wheat farmers and cage-free egg farmers in perfectly competitive markets.

In the next two chapters, we discuss the remaining market structures: oligopoly and monopoly.

CHAPTER SUMMARY AND PROBLEMS

Key Terms

Brand management, p. 470

Marketing, p. 470

Monopolistic competition, p. 456

13.1 Demand and Marginal Revenue for a Firm in a Monopolistically Competitive Market

LEARNING OBJECTIVE: Explain why a monopolistically competitive firm has downward-sloping demand and marginal revenue curves.

Summary

A firm competing in a **monopolistically competitive** market sells a differentiated product. Therefore, unlike a firm in a perfectly competitive market, it faces a downward-sloping demand curve. When a monopolistically competitive firm cuts the price of its product, it sells more units but must accept a lower price on the units it could have sold at the higher price. As a result, its marginal revenue curve is downward sloping. Every firm that has the ability to affect the price of the good or service it sells will have a marginal revenue curve that is below its demand curve.

Review Questions

1.1 What are the most important differences between perfectly competitive markets and monopolistically competitive markets? Give two examples of products sold in perfectly competitive markets and two examples of products sold in monopolistically competitive markets.

1.2 Why does a local McDonald's face a downward-sloping demand curve for its Quarter Pounders? If a McDonald's raises the price of Quarter Pounders above the prices other local fast-food restaurants charge for hamburgers, won't it lose all its customers?

1.3 With a downward-sloping demand curve, why is average revenue equal to price? Why is marginal revenue less than price?

Problems and Applications

1.4 There are about 400 wineries in California's Napa Valley. Describe the reaction of consumers if the owner of one of the wineries—Chip Case's Wine Emporium—raises the price of his wine by $5 per bottle, assuming the following:

a. The industry is perfectly competitive.

b. The industry is monopolistically competitive.

1.5 Brick-and-mortar bookstores face intense competition from online sellers such as Amazon, as well as from large stores such as Walmart and Target that sell popular books at low prices. According to an article in the *Wall Street Journal*, Barnes & Noble CEO James Daunt has adopted a new strategy: Rather than have each Barnes & Noble store offer the same selection of books displayed in the same way, he is giving local store managers discretion over many of the books they stock and how they display the books. Many store managers have begun to stock more books written by local authors. The article quotes one book publisher as noting that the new strategy "lessens Barnes & Noble's dependence on books sold by Target and Walmart." Explain the goal of Daunt's business strategy in terms of the economic concepts in Section 13.1 of the chapter.

1.6 A private-label product is made specifically for the store and has the store's name on the label. In a video on wsj.com, a reporter for the *Wall Street Journal* noted that in Trader Joe's grocery stores, "the vast majority of what they sell is private label. . . . People can go and feel they are discovering something new." The video also noted that private-label products at Trader Joe's "have created a large and loyal customer fan base." For Trader Joe's, has relying more on stocking private-label products than the national brands available in most supermarkets made the firm's demand curve more price elastic or less price elastic? Briefly explain.

1.7 Fill in the missing values in the following table, which shows the demand for snow skiing lessons per day at a resort in Vermont:

Snow Skiing Lessons per Day (Q)	Price (P)	Total Revenue ($TR = P \times Q$)	Average Revenue $\left(AR = \frac{TR}{Q}\right)$	Marginal Revenue $\left(MR = \frac{\Delta TR}{\Delta Q}\right)$
0	$80.00			
1	75.00			
2	70.00			
3	65.00			
4	60.00			
5	55.00			
6	50.00			
7	45.00			
8	40.00			

1.8 Starbucks Corporation's quarterly sales reached a record level in the fall of 2022. The coffee company, which already had more than 35,000 locations worldwide, added 763 stores during that quarter. Howard Schultz, who was CEO at the time, said "higher menu prices haven't slowed sales. . . . Prices are up around 6% overall."

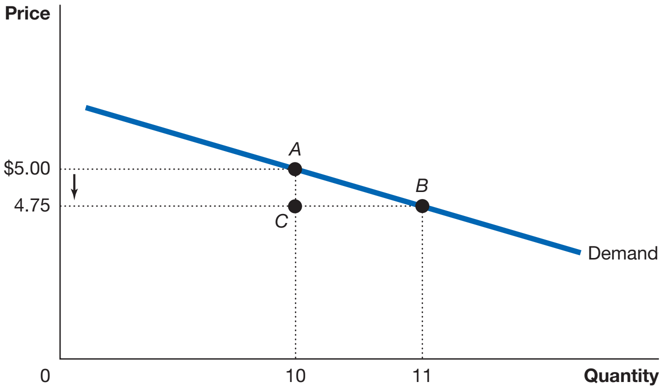
a. Is the market in which coffeehouses like Starbucks operate perfectly competitive? How does the demand curve for a cup of coffee from a Starbucks compare with the demand curve for wheat from a single wheat farm?

b. Howard Schultz claimed that "higher menu prices haven't slowed sales." There are many other coffeehouses. Why did some consumers continue to buy coffee from Starbucks, rather than from other coffeehouses, despite Starbucks charging higher prices?

c. If Starbucks already had 35,000 locations worldwide, why would the firm use some of its profits to invest in 763 additional stores in a single three-month period?

1.9 Is it possible for marginal revenue to be negative for a firm selling in a perfectly competitive market? Is it possible for marginal revenue to be negative for a firm selling in a monopolistically competitive market? Briefly explain.

1.10 In the following graph, consider the marginal revenue of the eleventh unit sold. When the firm cuts the price from \$5.00 to \$4.75 to sell the eleventh unit, what area in the graph shows the output effect, and what is the dollar value of the output effect? What area in the graph shows the price effect, and what is the dollar value of the price effect? What is the marginal revenue of the eleventh unit?



1.11 Sally runs a vegetable stand. The following table shows two points on the demand curve for the heirloom tomatoes she sells.

Price	Quantity Demanded per Week
\$5.00	100,000
\$3.25	200,000

a. What would be Sally's marginal revenue from lowering the price of tomatoes from \$5.00 to \$3.25?

b. Calculate the output effect and the price effect from lowering the price to \$3.25.

13.2 How a Monopolistically Competitive Firm Maximizes Profit in the Short Run

LEARNING OBJECTIVE: Explain how a monopolistically competitive firm maximizes profit in the short run.

Summary

A monopolistically competitive firm maximizes profit at the level of output where marginal revenue equals marginal cost. Price equals marginal revenue for a perfectly competitive firm, but price is greater than marginal revenue for a monopolistically competitive firm. Therefore, unlike a perfectly competitive firm, which produces where $P = MC$, a monopolistically competitive firm produces where $P > MC$.

Review Questions

2.1 Why doesn't a monopolistically competitive firm produce where $P = MC$, as a perfectly competitive firm does?

2.2 Isabella runs a pet salon. She is currently grooming 125 dogs per week. If instead of grooming 125 dogs, she grooms 126 dogs, she will add \$68.50 to her costs and \$60.00 to her revenues. What will be the effect on her profit of grooming 126 dogs instead of 125 dogs?

2.3 If Daniel sells 350 hamburgers at a price of \$3.25 each, and his average cost of producing 350 hamburgers is \$3.00 each, what is his profit?

Problems and Applications

2.4 Shortly before the beginning of the Covid–19 pandemic, officials at Washington, DC's Metro subway system debated ways to reverse a decline in ridership. The system's costs significantly exceeded its revenues, resulting in an operating deficit that had to be covered by contributions from the local governments the system serves. One proposal to increase ridership was to run the same number of subway trains during off-peak hours as the system was running during peak hours. A member of the system's board of directors raised the possibility that "the marginal cost of running the additional service exceeds the marginal revenue of the new people we're getting." Briefly explain which of the following correctly characterizes this member's statement about the likely results of increasing the number of trains run during off-peak hours.

i. The Metro's revenue would increase, but its operating deficit would decline.

ii. The Metro's revenue and operating deficit would both decline.

iii. The Metro's revenue and operating deficit would both increase.

iv. The Metro's revenue would decline, but its operating deficit would increase.

2.5 Maria manages a bakery that specializes in ciabatta bread. The following table shows her bakery's demand schedule and total costs.

Ciabatta Bread Sold per Hour (*Q*)	Price (*P*)	Total Cost (*TC*)
0	$6.00	$3.00
1	5.50	7.00
2	5.00	10.00
3	4.50	12.50
4	4.00	14.50
5	3.50	16.00
6	3.00	17.00
7	2.50	18.50
8	2.00	21.00

a. To maximize profit, how many loaves of ciabatta bread should Maria sell per hour, what price should she charge, and how much profit will she make?

b. What is the marginal revenue Maria receives from selling the profit-maximizing quantity of ciabatta bread? What is the marginal cost of producing the profit-maximizing quantity of ciabatta bread?

2.6 **[Related to Solved Problem 13.2]** Suppose a firm producing table lamps has the costs shown in the following table.

Quantity (*Q*)	Average Total Cost (*ATC*)
1,000	$15.00
2,000	9.75
3,000	8.25
4,000	7.50
5,000	7.75
6,000	8.50
7,000	9.75
8,000	10.50
9,000	12.00

Ben and Jerry are managers at the company, and they have this discussion:

Ben: We should produce 4,000 lamps per month because that will minimize our average cost.

Jerry: But shouldn't we maximize profit rather than minimize cost? To maximize profit, don't we need to take demand into account?

Ben: Don't worry. By minimizing average cost, we will be maximizing profit. Demand will determine how high the price we can charge will be, but it won't affect our profit-maximizing quantity.

Evaluate the discussion between the two managers.

2.7 **[Related to the Chapter Opener]** According to an article in the *Wall Street Journal* in early 2023, Starbucks "plans to add nearly 400 U.S. stores with only delivery or pickup service in the next three years." The article noted that "restaurants that bring fewer customers inside cost less to build, maintain and staff." Draw a graph showing the effect of this cost decline on the price of a Starbucks cappuccino, on the quantity of cappuccinos a representative Starbucks coffeehouse sells, and on the profit of this Starbucks coffeehouse. Be sure that your graph includes this coffeehouse's demand, marginal revenue, marginal cost, and average total cost curves. Your graph should show changes in any of the curves. For simplicity, assume that the demand for Starbucks cappuccinos is unchanged.

2.8 William Germano served as the vice president and publishing director at the Routledge publishing company. He once gave the following description of how a publisher might deal with an unexpected increase in the cost of publishing a book:

> It's often asked why the publisher can't simply raise the price [if costs increase]. . . . It's likely that the editor [is already] . . . charging as much as the market will bear. . . . In other words, you might be willing to pay $50.00 for a . . . book on the Brooklyn Bridge, but if . . . production costs [increase] by 25 percent, you might think $62.50 is too much to pay, though that would be what the publisher needs to charge. And indeed the publisher may determine that $50.00 is this book's ceiling—the most you would pay before deciding to rent a movie instead.

a. According to what you have learned in this chapter, how do firms adjust the price of a good when there is an increase in cost? Use a graph to illustrate your answer.

b. Does the model of monopolistic competition seem to fit Germano's description? If a publisher does not raise the price of a book following an increase in its production cost, what will be the result?

c. How would the elasticity of demand for published books affect the ability of the publishing company to raise book prices when costs increase?

2.9 In 1916, Ford Motor Company produced 500,000 Model T Fords, at a price of $440 each. The company made a profit of $60 million that year. Henry Ford told a newspaper reporter that he intended to reduce the price of the Model T to $360, and he expected to sell 800,000 cars at that price. Ford said, "Less profit on each car, but more cars, more employment of labor, and in the end we get all the total profit we ought to make."

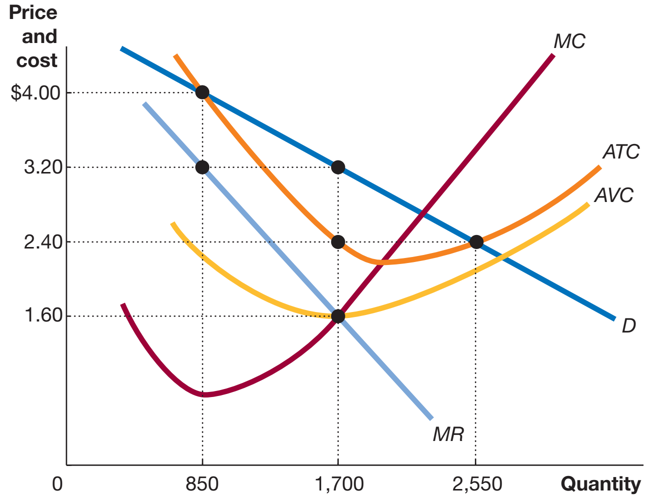
a. Did Ford expect the total revenue he received from selling Model Ts to rise or fall following the price cut?

b. Use the information given above to calculate the price elasticity of demand for Model Ts. Use the midpoint formula to make your calculation. (See Chapter 6 if you need a refresher on the midpoint formula.)

c. What would the average total cost of producing 800,000 Model Ts have to be for Ford to make as much profit selling 800,000 cars as it made selling 500,000 cars? Is this smaller or larger than the average total cost of producing 500,000 Model Ts?

d. Assume that Ford would make the same total profit when selling 800,000 cars as when selling 500,000 cars. Was Henry Ford correct in saying he would make less profit per car when selling 800,000 cars than when selling 500,000 cars?

2.10 Use the following graph for Elijah's Burgers to answer the questions.



- **a.** If Elijah produces at the profit-maximizing level of output, how much is his total revenue? How much is his total cost? Briefly explain your calculations.
- **b.** How much economic profit is Elijah earning? Briefly explain your calculation.

13.3 What Happens to Profits in the Long Run?

LEARNING OBJECTIVE: Analyze the situation of a monopolistically competitive firm in the long run.

Summary

If a monopolistically competitive firm earns an economic profit in the short run, entry of new firms will eliminate the profit in the long run. If a monopolistically competitive firm is suffering an economic loss in the short run, exit of existing firms will eliminate the loss in the long run. Monopolistically competitive firms continually struggle to find new ways of differentiating their products as they try to stay one step ahead of other firms that are attempting to copy their success.

Review Questions

3.1 What effect does the entry of new firms have on the demand curve of an existing firm in a monopolistically competitive market?

3.2 What is the difference between zero accounting profit and zero economic profit?

3.3 A business analyst gives the following advice to managers of firms: "If you continue to swim in a sea of sameness, you are going to drown." Briefly explain what he means.

Problems and Applications

3.4 In a review in the *Wall Street Journal* of several business books, Princeton economist Burton Malkiel observed that: "The broad business lesson comes through clearly: It is difficult yet potentially rewarding to go against the grain. But insightful strategies that can easily be copied will eventually lose their advantage."

- **a.** What does Malkiel mean by a business "going against the grain"? Why would a business find doing so to be both difficult and potentially rewarding?
- **b.** What does Malkiel mean when he writes "insightful strategies that can easily be copied will eventually lose their advantage"? What advantage is he referring to?

3.5 After McDonald's added breakfast items to its menu, Wendy's also added breakfast items to its menu. But it failed to successfully compete with McDonald's for breakfast customers and removed the breakfast items from its menu. Wendy's tried and failed twice more in later years to make breakfast profitable. But a fourth attempt was successful. In March 2020, "Wendy's paid for equipment to serve breakfast and launched the offering with great fanfare. . . . Wendy's claims it is now making money." Other restaurant chains, including Taco Bell and White Castle, have also begun to offer breakfast items.

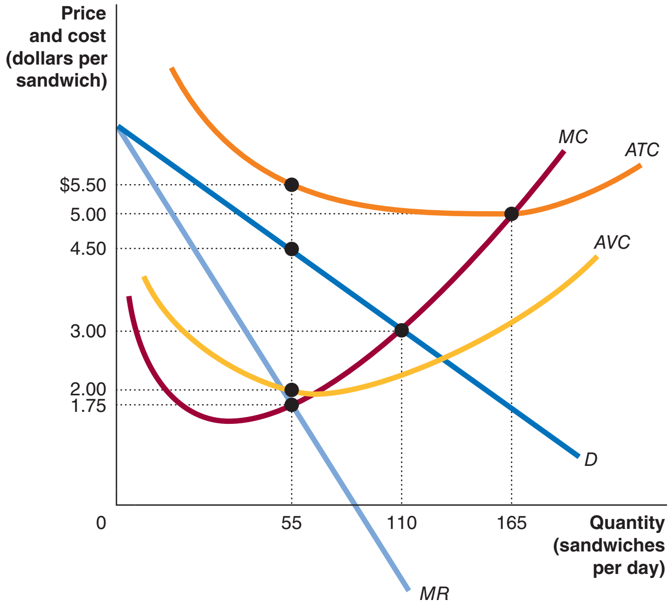
- **a.** After failing three times, why did Wendy's attempt a fourth time to add breakfast meals to its menus?
- **b.** Assume that Wendy's earns profits from breakfast sales in the short run. Will the company earn profits from breakfast sales in the long run? Briefly explain.

3.6 The late Thomas McCraw of Harvard Business School once wrote that "when their innovations dwindle, firms begin to die."

- **a.** What is an innovation?
- **b.** What does McCraw mean by "when their innovations dwindle"?
- **c.** Briefly explain whether you agree that when a firm stops innovating, it is likely to die.

3.7 **[Related to the Chapter Opener]** JAB, a German company that now owns both Peet's and Intelligentsia, has been focusing on sales of cold-brew coffee, which it sells in supermarkets and convenience stores. According to an article in the *Wall Street Journal*, "Making and distributing cold-brewed coffee, in particular, is challenging and expensive because it requires a lot of coffee beans to extract the flavor." If cold-brew coffee is more costly for JAB to produce than is conventional ground coffee or hot coffee sold in coffeehouses (JAB sells those types of coffee as well), why would JAB focus on it? Ten years from now, would you expect JAB's economic profit from selling cold-brew coffee to be higher, lower, or about the same as it is today? Briefly explain.

3.8 **[Related to the Economics in Your Life & Career]** Suppose Angelica opens a small store selling beef brisket sandwiches near campus. Use the following graph, which shows the demand and cost for Angelica's beef brisket sandwiches, to answer the following questions.



a. If Angelica wants to maximize profit, how many beef brisket sandwiches should she sell per day, and what price should she charge? Briefly explain your answer.

b. How much economic profit (or loss) is Angelica earning? Briefly explain.

c. Is Angelica likely to continue selling this number of beef brisket sandwiches in the long run? Briefly explain.

3.9 **[Related to the Don't Let This Happen to You]** A student remarks:

> If firms in a monopolistically competitive industry are earning an economic profit, new firms will enter the industry. Eventually, a representative firm will find that its demand curve has shifted to the left, until it is just tangent to its average total cost curve and the firm is earning zero profit. Because firms are earning zero profit at that point, some firms will leave the industry, and the representative firm will find that its demand curve will shift to the right. In long-run equilibrium, price will be above average total cost by just enough so that each firm is just breaking even.

Briefly explain whether you agree with this analysis.

3.10 During the Covid–19 pandemic, Microsoft decided to permanently close all of its retail stores in the United States. Many of the Microsoft products that had been available in its stores, such as the Xbox gaming console, are also sold in other stores, such as Best Buy. Draw a graph showing the effect on a representative Best Buy store of the exit of Microsoft from the electronics retail store market. For simplicity, assume that the only product Best Buy sells is Xbox game consoles. Be sure that your graph includes the Best Buy store's demand (*D*), marginal revenue (*MR*), marginal cost (*MC*), and average total cost (*ATC*) curves. Your graph should show changes in any of the curves. It should also show any changes in the area representing the store's economic profit (or loss). Be sure to explain any assumptions you are making.

3.11 **[Related to the Apply the Concept "Can Third Wave Coffeehouses Remain Profitable?"]** An article in the *Wall Street Journal* noted the following changes Starbucks was making to improve its profitability: (1) Because the majority of beverages Starbucks sells now contain ice, it had invented (and patented) a new machine to produce cold-brew coffee more quickly; (2) it was adding pastries and to-go salads to its food menus; (3) it was adding new coffeehouses for pickup, delivery, or drive-through orders only; and (4) it was redesigning the behind-the-counter layout to allow its baristas to prepare orders more quickly. Which of these changes will third wave coffeehouses such as Blue Bottle Coffee be likely to respond to, and which might they be unwilling or unable to respond to? Briefly explain.

3.12 **[Related to Solved Problem 13.3]** Draw a graph similar to panel (a) of Figure 13.5, showing the effect of Target's building sortation centers, assuming that doing so causes a decline in *both the fixed cost and the marginal cost* of selling microwaves. Your graph should show the changes in Target's cost curves, in its profit-maximizing price and quantity, and in the area representing its profit. For simplicity, assume that the only product Target sells is microwaves.

3.13 An article in the *Wall Street Journal* discussed the sidewalk vegetable stands in New York City's Chinatown. About 80 of these small vegetable stands operate along a handful of streets in that neighborhood. Most supermarkets buy vegetables from large wholesalers. In contrast, the entrepreneurs who run the stands in Chinatown buy from smaller wholesalers located in the neighborhood. These wholesalers, in turn, buy primarily from smaller family farms, some located overseas. Because these wholesalers make several deliveries per day, the owners of the stands do not have to invest in substantial storage space and the refrigerators that supermarkets use to keep vegetables fresh. The reporter compared prices for vegetables sold by these stands with prices for vegetables sold by her supermarket: "In almost every case, Chinatown's prices were less than half what I would pay at the supermarket. Among the bargains: broccoli for 85 cents a pound, $1 each for pomegranates, oranges for a quarter."

a. Is it likely that the owners of these vegetable stands are earning an economic profit? Briefly explain.

b. Why doesn't competition among supermarkets drive the prices of vegetables they sell down to the prices of the vegetables sold in the Chinatown stands?

13.4 Comparing Monopolistic Competition and Perfect Competition

LEARNING OBJECTIVE: Compare the efficiency of monopolistic competition and perfect competition.

Summary

Perfectly competitive firms produce at a quantity where price equals marginal cost and at minimum average total cost. Perfectly competitive firms achieve both allocative and productive efficiency. Monopolistically competitive firms produce at a quantity where price is greater than marginal cost and above minimum average total cost. Monopolistically competitive firms do not achieve either allocative or productive efficiency. Consumers face a trade-off when buying the product of a monopolistically competitive firm: They are paying a price that is greater than marginal cost, and the product is not being produced at minimum average total cost, but they benefit from being able to purchase a product that is differentiated and more closely suited to their tastes.

Review Questions

4.1 What are the differences between the long-run equilibrium of a perfectly competitive firm and the long-run equilibrium of a monopolistically competitive firm?

4.2 Why is a monopolistically competitive firm not productively efficient? In what sense does a monopolistically competitive firm have excess capacity?

4.3 Why is a monopolistically competitive firm not allocatively efficient?

4.4 Does the fact that monopolistically competitive markets are not allocatively or productively efficient mean that there is a significant loss in economic well-being to society in these markets? In your answer, be sure to define what you mean by "economic well-being."

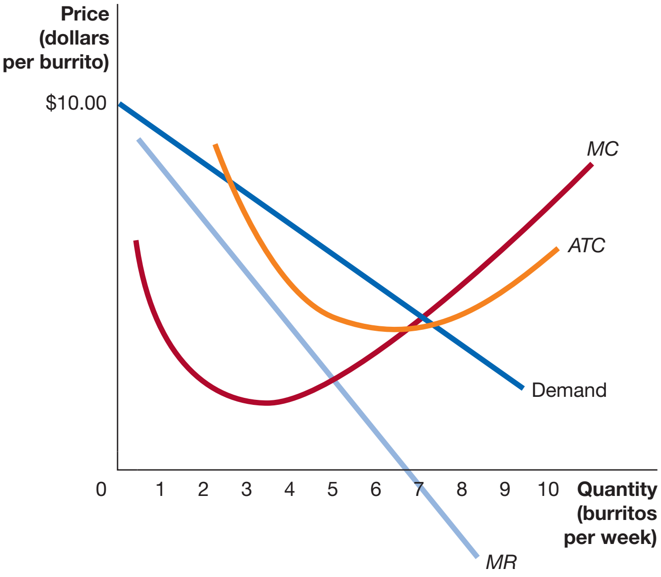
Problems and Applications

4.5 A student makes the following comment:

> I can understand why a perfectly competitive firm won't earn a profit in the long run—because it charges a price equal to marginal cost. But a monopolistically competitive firm can charge a price greater than marginal cost, so why can't it continue to earn a profit in the long run?

How would you answer this question?

4.6 Consider the following graph.



a. Is it possible to say whether this firm is perfectly competitive or monopolistically competitive? If so, explain how you are able to make this determination.

b. Does the graph show a short-run equilibrium or a long-run equilibrium? Briefly explain.

c. What quantity on the graph represents long-run equilibrium if the firm is perfectly competitive?

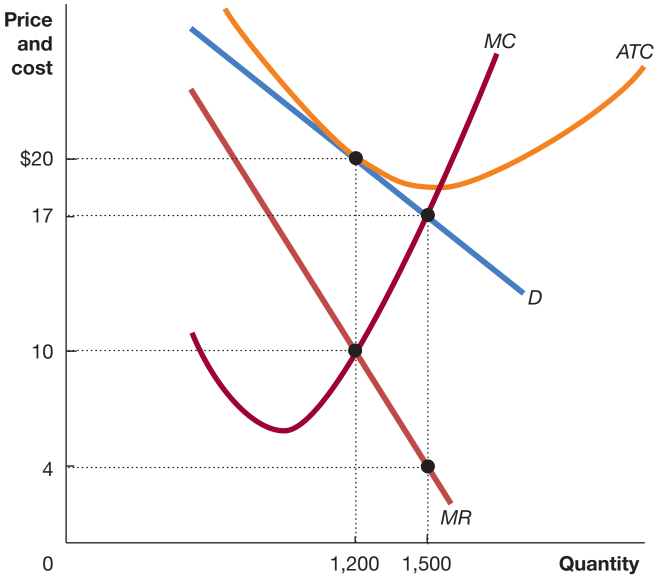
4.7 [**Related to the Apply the Concept "Can sweetgreen Earn an Economic Profit Selling Fast Food to Millennials and Gen Zs?"**] In early 2023, an article in the *New York Times* indicated that analysts of the restaurant industry were still optimistic that the sweetgreen chain would eventually become profitable. The analysts considered sweetgreen's strengths to be the large fraction of its sales that were made digitally using its app and the loyalty of its customers. sweetgreen's cost of fulfilling digital sales is lower than its cost of fulfilling in-person sales.

a. Does sweetgreen making more of its sales digitally represent an increase or a decrease in productive efficiency? Does it represent an increase or a decrease in allocative efficiency? Briefly explain.

b. Does the loyalty of sweetgreen's customers indicate that sweetgreen has increased or decreased productive efficiency in the restaurant business? Does it indicate that sweetgreen has increased or decreased the allocative efficiency of the restaurant business? Briefly explain.

c. Has the existence of sweetgreen increased the well-being of its customers? If it has, would that be enough to ensure that the chain will make an economic profit? Briefly explain.

4.8 Consider the following graph.



a. At the profit-maximizing level of output, how much economic profit is this firm earning? Briefly explain.

b. Is this firm allocatively efficient? Is it productively efficient? Briefly explain.

4.9 **[Related to the Chapter Opener]** The third wave coffeehouse Intelligentsia offers 46 different "In Season" coffees over the course of the year. These coffees are sold to customers closer to the time the coffee beans were picked than is true of most coffee other coffeehouses sell. According to Intelligentsia's president, James McLaughlin, "You have a 9-month window to get it packed up and shipped. After that, there's a degradation of quality."

a. Explain whether Intelligentsia achieves productive efficiency, given that it offers its customers such a large number of coffees, rather than the limited number that most other coffeehouses offer.

b. Briefly explain how Intelligentsia's product differentiation may benefit its customers more than if the coffeehouse achieved allocative and productive efficiency.

13.5 How Marketing Differentiates Products

LEARNING OBJECTIVE: Define marketing and explain how firms use it to differentiate their products.

Summary

Marketing refers to all the activities necessary for a firm to sell a product to a consumer. Firms use two marketing tools to differentiate their products: brand management and advertising. **Brand management** refers to the actions of a firm that are intended to maintain the differentiation of a product over time. When a firm has established a successful brand name, it has a strong incentive to defend it. A firm can apply for a *trademark*, which grants legal protection against other firms using its product's name.

Review Questions

5.1 Define *marketing*. Is marketing just another name for advertising?

5.2 Why are many companies so concerned about brand management?

Problems and Applications

5.3 Draw a graph that shows the effect on a firm's profit when it increases spending on advertising but the increased advertising has *no* effect on the demand for the firm's product.

5.4 A skeptic says, "Marketing research and brand management are unnecessary. If a company wants to find out what customers want, it should simply look at what they're already buying." Do you agree with this comment? Briefly explain.

5.5 A column in the *Wall Street Journal* argues that many firms have shifted away from traditional advertising toward providing "content": "Content, these days, is the catchall term for all the media that we consume. . . . Tweets are content. Articles are content. Instagram posts are definitely content." The column also describes the YouTube videos many firms produce to highlight their products and the articles and other content—which may not be directly related to their products—that they post on their websites. What are the potential advantages and disadvantages to firms of replacing traditional advertising with "content" of this type?

5.6 Some companies have done a poor job protecting the images of their products. For example, Hormel's Spam brand name is widely ridiculed and is associated with annoying commercial messages received via e-mail. Think of other cases of companies failing to protect their brand names. What can companies do about the situation? Should the companies rebrand their products?

13.6 What Makes a Firm Successful?

LEARNING OBJECTIVE: Identify the key factors that determine a firm's success.

Summary

A firm's owners and managers control some of the factors that determine the profitability of the firm. Other factors affect all the firms in the market or result from chance, so they are not under the control of the firm's owners. The interactions between factors the firm controls and factors it does not control determine its profitability.

Review Questions

6.1 What are the key factors that determine the profitability of a firm in a monopolistically competitive market?

6.2 How might a monopolistically competitive firm continually earn an economic profit?

Problems and Applications

6.3 The hamburger chain Smashburger differentiates itself from other fast-food restaurants in the way it prepares its burgers: "Every burger at Smashburger starts as a fresh, never frozen ball of all-natural beef. As soon as you order, we smash that fresh ball of beef on a hot grill to sear the burger and seal in the juiciness." When Scott Crane became president of the firm in 2007, it had only two restaurants. When he left 10 years later, the chain had grown to 330 restaurants in 35 states. An article in the *Wall Street Journal* describing Crane's time running Smashburger notes that during the 2007–2009 economic recession, "Americans were looking for more value when they dined out. Also, real-estate prices had gone down, so Smashburger was able to expand in a way that wouldn't have been affordable before." Is it ever easy to determine whether a firm making an economic profit is doing so because of the skills of the firm's managers or because of luck? Briefly explain by discussing the situation of Scott Crane at Smashburger.

6.4 **[Related to the Economics in Your Life & Career]** An article in the *Wall Street Journal* discussed the Ground Round restaurant chain, which had 219 restaurants at its peak in 1989 but today has only 9. According to the article, "Ground Round had its heyday in the 1980s, building its reputation on juicy hamburgers, a publike atmosphere and unlimited popcorn and peanuts." Do restaurants face any particular problems in being able to earn an economic profit in the long run? Briefly explain.

6.5 An opinion column in the *Wall Street Journal* observed that "firms can prosper over the long term only if they're able to learn, adapt, and regularly transform themselves. . . . Successful firms may well need to reinvent their strategies every five to ten years." If the owner of a firm is currently earning an economic profit, why would the owner want to transform the firm or change his or her strategy?

6.6 **[Related to the Apply the Concept "Is Being the First Firm in the Market a Key to Success?"]** A firm that is first to market with a new product frequently discovers that there are design flaws or problems with the product that were not anticipated. For example, the ballpoint pens made by the Reynolds International Pen Company often leaked. What effect do such problems cause for the innovating firm, and how do these unexpected problems create possibilities for other firms to enter the market?

6.7 **[Related to the Apply the Concept "Is Being the First Firm in the Market a Key to Success?"]** In an interview, Tony Xu, the co-founder and CEO of DoorDash, the food delivery service, was quoted as saying that first-mover advantage is a myth: "I'd rather be the last mover." Why might it be better not to be the first firm to attempt to make a profit building an app-based food delivery business? Are there any risks in being a "last mover" in that business? Briefly explain.

Critical Thinking Exercises

CT13.1 Suppose that a perfectly competitive firm finds a way to differentiate its product and become a monopolistically competitive firm.

- **a.** Explain how the graph showing the firm's demand, marginal revenue, and cost curves would change as a result. If any curves change, briefly explain how they change.
- **b.** Explain whether you think this firm would be earning a profit in its new position as a monopolistically competitive firm.

CT13.2 For this exercise, your instructor may assign you to a group. Perhaps you've thought about being an entrepreneur and have a product or service in mind. If you haven't, think of a product or service now. Each member of the group should briefly describe his or her product or service. The group should pick one of the products or services mentioned and develop a brief plan for selling it. How well do your group's plans conform to the ideas in Section 13.5?

CT13.3 Section 13.5 describes how firms differentiate their products. You've likely flown on an airplane and know that all airline seats are similar, particularly in coach. Think about what service an airline is selling when you buy a ticket for a particular seat. Conduct online research to find out how airlines differentiate their services. Write two paragraphs summarizing your findings.

14

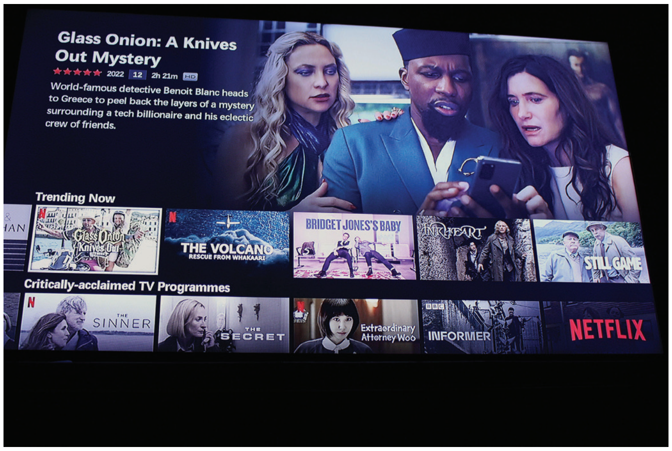
Oligopoly: Firms in Less Competitive Markets

Can Netflix and Disney+ Earn a Profit Streaming Video?

It's not often that one person is able to disrupt an industry twice, but Reed Hastings did just that in the market for home video. For decades after television sets became common in the late 1940s, the only way to see a movie or an episode of a series was to watch at the time it was broadcast. Then, in the late 1970s, several firms, including Sony and JVC, began selling videocassette recorders (VCRs), and home video was born. By the mid-1980s, there were thousands of stores renting videocassettes of movies and episodes of television series. Most of the stores were small. In 1985, David Cook founded Blockbuster Video. The firm took advantage of the economies of scale provided by sophisticated software that could track inventories of videocassettes and the rental habits of customers. Blockbuster drove most of its small competitors out of business and eventually opened 4,000 stores in the United States.

Although competing against Blockbuster in the home video market was challenging, Hastings and his business partner Marc Randolph realized that technological change provided an opening. In 1997, Sony began selling DVD players in the United States. Hastings and Randolph realized that DVDs could be mailed to customers at low cost and without being damaged, and they founded Netflix.com to rent DVDs online. For a subscription fee of $19.99 per month, a customer could rent four DVDs at a time, receiving and returning them through the mail. There was no limit on how long a customer could keep a DVD. This was an important contrast with Blockbuster, which charged a significant late fee if a video wasn't returned within the three-day rental window.

Netflix grew very rapidly, leading to a collapse in revenue at Blockbuster and other brick-and-mortar video rental stores. Blockbuster declared bankruptcy in 2010, and in 2023, only a single Blockbuster store (in Bend, Oregon) remained open. After disrupting the home video market by offering an online subscription rental service, Hastings realized that he could disrupt the market a second time. The spread of high-speed Wi-Fi meant that most customers would eventually switch from watching movies on DVDs to streaming them. By 2010, Netflix's main subscription plan was streaming only, and the company stopped renting DVDs in 2023.


Glass Onion: A Knives Out Mystery
2022 12 2h 21m
World-famous detective Benoit Blanc heads to Greece to peel back the layers of a mystery surrounding a tech billionaire and his eclectic crew of friends.
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BRIDGET JONES'S BABY
INKHEART
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THE SINNER
THE SECRET
Extraordinary Attorney Woo
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NETFLIX

Aldercy Carling/Alamy Stock Photo

Netflix's economic profits attracted large entertainment firms like Disney, Amazon, Apple, and Paramount to also enter the market for streaming video. By 2023, as a result of competition and the high costs of producing movies and series, Netflix's profits were declining, and Disney+ and Paramount+ were suffering losses. Although Amazon and Apple don't report separately their earnings from Amazon Prime Video and Apple TV+, both services were likely experiencing losses. Netflix, Amazon, and Disney tried to increase their profits by offering lower-priced streaming options that show commercials. All the services were struggling to develop strategies that would allow them to earn a profit consistently.

An industry like streaming video that includes only a few firms is an oligopoly. In an *oligopoly*, a firm's profitability depends on its interactions with other firms. In these industries, firms must develop business strategies that involve not just deciding what price to charge and what quantity to produce but also how much to advertise, which new technologies to adopt, and how to manage relationships with suppliers.

There are relatively few firms competing in an oligopolistic industry, so each firm must monitor and react to other firms' actions or risk a substantial decline in sales. In this chapter, we focus on these strategic interactions among firms.

Chapter Outline & Learning Objectives

14.1 Oligopoly and Barriers to Entry, page 486
Show how barriers to entry explain the existence of oligopolies.

14.2 Game Theory and Oligopoly, page 490
Use game theory to analyze the strategies of oligopolistic firms.

14.3 Sequential Games and Business Strategies, page 498
Use sequential games to analyze business strategies.

14.4 The Five Competitive Forces Model, page 502
Use the five competitive forces model to analyze competition in an industry.

Economics in Your Life & Career

If You Were Managing a Walmart, Would You Cut the Price of a PlayStation 5?

Suppose that you are a manager at Walmart and are responsible for setting the prices of consumer electronics. Currently, you are charging $490 for a PlayStation 5 game console, which is the same price being charged by Amazon, Best Buy, and Target. Your assistant manager makes the following proposal: "Let's cut the price to $440. By selling for $50 less than our competitors, we'll gain a lot of their customers and increase our profit." Do you accept this proposal? As you read this chapter, try to answer this question. You can check your answer against the one we provide at the end of this chapter.

In studying perfectly competitive and monopolistically competitive industries, our analysis focused on how to determine a firm's profit-maximizing price and quantity. We concluded that firms maximize profit by producing where marginal revenue equals marginal cost, or $MR = MC$. To determine a firm's profit-maximizing price and quantity, we used graphs that included the firm's demand, MR, and MC curves. In analyzing oligopoly, there are two reasons we cannot rely on the same types of graphs we use in analyzing perfect competition and monopolistic competition:

1. We need to use economic models that allow us to analyze the more complex business strategies of large oligopoly firms. These strategies involve more than choosing the profit-maximizing price and quantity.
2. Even in determining the profit-maximizing price and quantity for an oligopoly firm, demand curves and cost curves are not as useful as in the cases of perfect competition and monopolistic competition. We are able to draw the demand curves for competitive firms by assuming that the prices these firms charge have no effect on the prices other firms in their industries charge. This assumption is realistic when each firm is small relative to the market. It is not a realistic assumption, however, for firms that are as large relative to their markets as Netflix, General Motors, or Walmart.

When large firms cut their prices, their rivals in the industry often—but not always—respond by also cutting their prices. Because we don't know for sure how other firms will respond to a price change, we don't know the quantity an oligopolist will sell at a particular price. In other words, it is difficult to know what an oligopolist's demand curve will look like. As we have seen, a firm's marginal revenue curve depends on its demand curve. If we don't know what an oligopolist's demand curve looks like, we also don't know what its marginal revenue curve looks like. Because we don't know marginal revenue, we can't calculate the profit-maximizing quantity and the profit-maximizing price the way we do for competitive firms.

The approach we use in this chapter to analyze competition among oligopolists is called *game theory*. Game theory can be used to analyze any situation in which groups or individuals interact. In the context of economic analysis, game theory is the study of the decisions firms make in industries where the profit of each firm depends on its interactions with other firms. Game theory has also been applied to strategies used in other contexts, such as international trade negotiations, political campaigns, and medical students choosing residency programs.

14.1 Oligopoly and Barriers to Entry

LEARNING OBJECTIVE: Show how barriers to entry explain the existence of oligopolies.

Oligopoly A market structure in which a small number of interdependent firms compete.

An **oligopoly** is an industry with only a few firms. This market structure lies between competitive industries, which have many firms, and monopolies, which have only a single firm. One measure of the extent of competition in an industry is the *concentration ratio*. Every five years, the U.S. Census Bureau publishes four-firm concentration ratios that measure the fraction of each industry's sales accounted for by its four largest firms. Most economists believe that a four-firm concentration ratio greater than 40 percent indicates that an industry is an oligopoly.

However, concentration ratios have the following flaws as measures of the extent of competition in an industry:

1. They do not include the goods and services that foreign firms export to the United States.
2. They are calculated for the national market, even though the competition in some industries, such as restaurants or college bookstores, is mainly local.

3. They do not account for competition that sometimes exists between firms in different industries. For example, Walmart is included in the discount department store industry but also competes with firms in the supermarket industry and the retail toy store industry.

Some economists prefer another measure of competition, known as the *Herfindahl-Hirschman Index* (see Chapter 15, Section 15.6). Despite their shortcomings, concentration ratios can provide a general idea of the extent of competition in an industry.

Table 14.1 lists examples of oligopolies in manufacturing and retail trade, along with representative firms from each industry. The U.S. Census Bureau does not track the video steaming industry separately. In 2023, however, just the following five firms accounted for more than 85 percent of video streaming subscriptions, making the industry an oligopoly: Netflix, Amazon, Apple, Disney, Paramount, and Warner Bros. Discovery (owner of the Max steaming service).

Barriers to Entry

Why do oligopolies exist? Why aren't there many more firms in the video streaming, athletic footwear store, beer, aircraft, or automobile industries? Recall that new firms will enter industries when existing firms are earning an economic profit. But new firms often have difficulty entering an oligopoly. Anything that keeps new firms from entering an industry in which firms are earning an economic profit is called a **barrier to entry**. Three important barriers to entry are economies of scale, ownership of a key input, and government-imposed barriers.

Barrier to entry Anything that keeps new firms from entering an industry in which firms are earning economic profits.

Economies of scale The situation in which a firm's long-run average cost falls as it increases the quantity of output it produces.

Economies of Scale

The most important barrier to entry is **economies of scale**, which exist when a firm's long-run average costs fall as the firm increases output (see Chapter 11, Section 11.6). The greater the economies of scale, the smaller the number of firms that will be in the industry. Figure 14.1 illustrates this point.

If economies of scale are relatively unimportant in an industry, the typical firm's long-run average cost curve (*LRAC*) will reach a minimum at a level of output (Q_1 in Figure 14.1) that is a small fraction of total industry sales. The industry will have room

Table 14.1

Examples of Oligopolies in Retail Trade and Manufacturing

Retail Trade		Manufacturing	
Industry	Four-Firm Concentration Ratio	Industry	Four-Firm Concentration Ratio
Home centers (Home Depot and Lowe's)	96%	Tobacco products (Phillip Morris and R.J. Reynolds)	91%
Couriers and express delivery (FedEx and UPS)	91%	Aircraft (Boeing and Lockheed Martin)	90%
Hobby, toy, and game stores (Hobby Lobby and Michael's)	78%	Breakfast cereal (Kellogg's and General Mills)	82%
Department stores (Macy's and Walmart)	73%	Bottled water (Aquafina and Poland Spring)	73%
Passenger airlines (Southwest and American)	71%	Dog and cat food (Hills and Nestlé Purina)	68%
Electronics stores (Best Buy and Apple)	71%	Chocolate and confectionary (Mars and Hershey)	59%
Bookstores (Barnes & Noble and Books-A-Million)	69%	Automobiles (Tesla and Ford)	58%
Movie theaters (AMC and Regal)	57%	Soft drinks (Coca-Cola and PepsiCo)	53%

Source: U.S. Census Bureau, "Concentration Ratios." (The values are for 2017.)

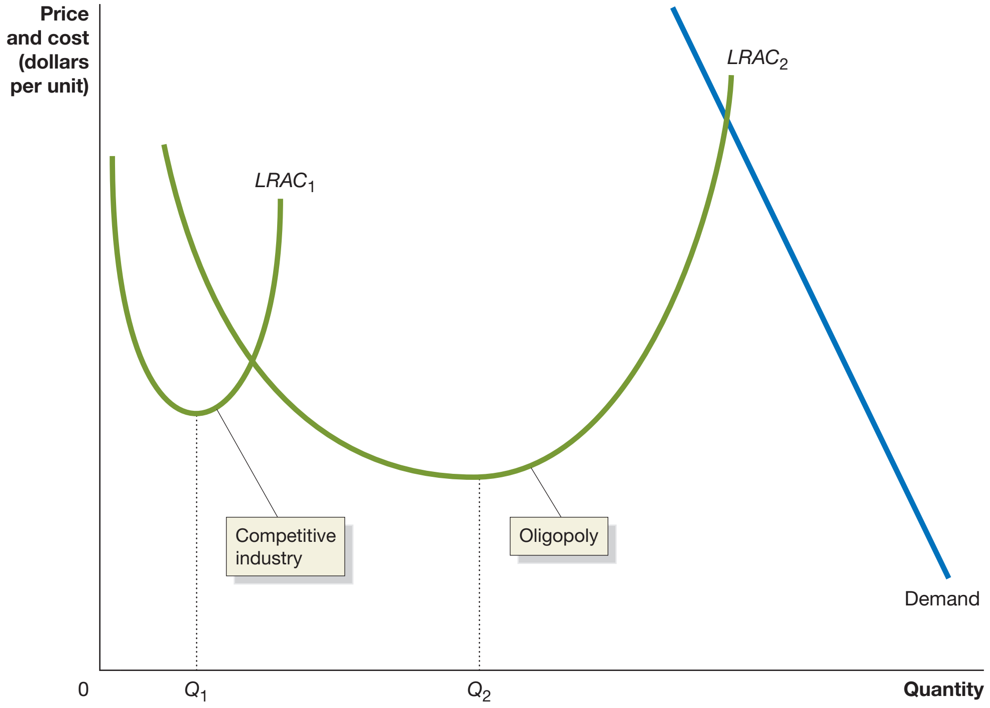


Figure 14.1 **Economies of Scale Help Determine the Extent of Competition in an Industry**

An industry will be competitive if the minimum point on the typical firm's long-run average cost curve ($LRAC_1$) occurs at a level of output that is a small fraction of total industry sales, such as Q_1. An industry will be an oligopoly if the minimum point on the typical firm's long-run average cost curve ($LRAC_2$) occurs at a level of output that is a large fraction of industry sales, such as Q_2.

for a large number of firms and will be competitive. If economies of scale are significant, the typical firm will not reach the minimum point on its long-run average cost curve (Q_2 in Figure 14.1) until it has produced a large fraction of industry sales. In that case, the industry will have room for only a few firms and will be an oligopoly.

Economies of scale can explain why there is much more competition in the restaurant industry than in the video streaming industry. Because very large restaurants do not have significantly lower average costs than smaller restaurants, the restaurant industry has room for many firms. In contrast, a large video streaming firm such as Netflix has much lower average costs than would a small video streaming firm, partly because a large firm can spread the high fixed costs of streaming video, including the large research and development costs for its app and the costs of developing and producing content, such as Netflix's *Stranger Things* series, over a much larger quantity of subscriptions sold.

Ownership of a Key Input If production of a good requires a particular input, then control of that input can be a barrier to entry. For many years, the Aluminum Company of America (Alcoa) controlled most of the world's supply of high-quality bauxite, the mineral needed to produce aluminum. The only way other companies could enter the industry to compete with Alcoa was to recycle aluminum. The De Beers Company of South Africa was able to block competition in the diamond market by controlling the output of most of the world's diamond mines. Until the 1990s, Ocean Spray had very little competition in the market for fresh and frozen cranberries because it controlled almost the entire supply of cranberries, which are mainly produced in the United States, Canada, and Chile. Even today, Ocean Spray controls about 65 percent of the cranberry crop through agreements with 700 cranberry growers.

Government-Imposed Barriers Firms sometimes try to convince the government to impose barriers to entry. Many large firms employ *lobbyists* to persuade state legislators and members of Congress to pass laws that are favorable to the economic interests of the firms. There are tens of thousands of lobbyists in Washington, DC, alone. Top lobbyists command annual salaries of $500,000 or more, which indicates the value firms place on their activities. Three important government-imposed barriers to entry are patents, restrictions on international trade, and licensing requirements.

A **patent** gives a firm the exclusive legal right to a new product for a period of 20 years from the date the patent application is filed with the government. Governments use patents to encourage firms to carry out research and development of new and better products and better ways of producing existing products. Output and living standards increase faster when firms devote resources to research and development, but a firm that spends money to develop a new product may not earn much profit if other firms can copy the product. For example, the pharmaceutical company Pfizer spends more than $8 billion per year on developing new prescription drugs. If rival companies could freely produce these new drugs as soon as Pfizer developed them, Pfizer would be unlikely to earn a return on its investment. Because Pfizer can patent a new drug, the firm can charge higher prices during the years the patent is in force and make an economic profit on its successful innovation. In 2020, Pfizer spent several billion dollars developing its Covid–19 vaccine in partnership with the German firm BioNTech. Some of the risk of this investment was offset when the U.S. federal government developed Operation Warp Speed, which guaranteed that it would purchase at least 100 million doses of the vaccine.

Patent The exclusive legal right to produce a product for a period of 20 years from the date the patent application is filed with the government.

Governments erect barriers to entering some industries by imposing tariffs and quotas on foreign competition. A *tariff* is a tax on imports, and a *quota* limits the quantity of a good that can be imported into a country (see Chapter 9, Section 9.4). A quota on foreign sugar imports severely limits competition in the U.S. sugar market. As a result, U.S. sugar companies can charge prices that are much higher than the prices companies outside the United States charge.

Governments also restrict competition through *occupational licensing*. For example, doctors and dentists in every state need licenses to practice. The justification for licensing laws is to protect the public from incompetent practitioners, but by restricting the number of people who can enter the licensed occupations, the laws also raise prices. For example, studies have shown that states that make it harder to earn a dentist's license have prices for dental services that are about 15 percent higher than in other states.

Apply the Concept

Are Unlicensed Yoga Instructors a Menace to Public Health?

If you need an operation, you want a surgeon who has a medical license. In fact, practicing medicine without a license has been illegal in every state since the early 1900s. But do you care whether the person who sells you flowers is a licensed florist? Or the person who cuts your hair is a licensed barber or stylist? Or the person who teaches your yoga class is a licensed instructor?

Getting a license to enter an occupation is often difficult. For example, you need a license to cut hair in Pennsylvania, and you can't get a license without completing a 1,250-hour barbering program that costs thousands of dollars; you also need to pass two exams. You can't trim a tree in California without having 1,460 hours of training and passing two exams, although 47 other states don't require tree trimmers to be licensed. Michigan requires three years of training to become a security guard, even though most other states require less than two weeks of training.

Wavebreakmedia Ltd PH85/Alamy Stock Photo

Should the government require yoga instructors to be licensed?

In 1950, only 5 percent of occupations in the United States required licenses compared with more than 25 percent today. More than 1,100 occupations are licensed in at least one state. Licensing of doctors and dentists seems necessary to protect the public from being injured by poorly trained practitioners. But many economists and policymakers believe that some licenses are primarily a means for the current members of an occupation to use the government to create a barrier to entry that reduces competition and increases their earnings. In many states, boards that oversee licensing requirements and examinations are staffed entirely by members of the occupation being licensed. Maury Gittleman of the U.S. Bureau of Labor Statistics, Mark A. Klee of the U.S. Census Bureau, and Morris M. Kleiner of the University of Minnesota estimate that the average person in a licensed occupation earns 7.5 percent more than the average person with comparable skills in an unlicensed occupation. Other estimates range as high as 15 percent.

Occupational licensing can disproportionately affect certain groups. For example, people with lower incomes have trouble affording the years of schooling or training that some licenses require. People who move frequently—particularly spouses of people in the military—may have to complete licensing requirements multiple times because some states don't accept licenses granted in other states. Many states bar people with a criminal record from obtaining a license, which makes it more difficult for people released from prison to find jobs. Research by Stephen Slivinski of Arizona State University indicates that states that have the strictest systems of licensing occupations experience significantly more crimes committed by people released from prison.

As we saw in an *Apply the Concept* in Chapter 8, Section 8.1, many economists and policymakers are concerned about barriers to new businesses being formed in the United States. Occupational licensing can be a barrier to people opening small businesses such as hair salons, lawn services, or yoga studios, and it has likely contributed to the difficulty many people encounter when trying to open a new business.

The Obama, Trump, and Biden administrations all urged a reduction in the number of occupations that require a license. In 2018, Congress passed legislation providing funds to states to evaluate occupational licenses. But because state legislatures, rather than Congress, typically enact occupational licenses, reform would need to occur at the state level. Recently, several states have been rethinking their approaches to occupational licensing. In April 2019, Arizona became the first state to automatically extend an occupational license to people who move into the state who are already licensed in another state. By 2023, 19 states had enacted Universal License Recognition (ULR) laws. According to the National Conference of State Legislatures, a ULR should establish "a uniform process to grant recognition to professional licenses issued by another state." But the conference also notes that "the scope of 'universal' recognition and what's required of applicants still varies from state-to-state." In most states, occupational licenses remain a significant government-imposed barrier to competition.

Your Turn: Test your understanding by doing related problem 1.12 at the end of this chapter.

In summary, to earn an economic profit, all firms would like to charge a price well above average total cost, but earning an economic profit attracts new firms to enter the industry. Eventually, the increased competition forces the price down to average total cost, and firms just break even. In an oligopoly, barriers to entry prevent—or at least slow down—entry, which allows firms to earn an economic profit over a longer period.

14.2 Game Theory and Oligopoly

LEARNING OBJECTIVE: Use game theory to analyze the strategies of oligopolistic firms.

Game theory The study of how people make decisions in situations in which attaining their goals depends on their interactions with others; in economics, the study of the decisions of firms in industries where the profits of a firm depend on its interactions with other firms.

As we noted at the beginning of the chapter, economists analyze oligopolies by using *game theory*, which was developed during the 1940s by the mathematician John von Neumann and the economist Oskar Morgenstern. **Game theory** is the study of how people make decisions in situations in which attaining their goals depends on their interactions with others. In oligopolies, the interactions among firms are crucial in determining profitability because the firms are large relative to the market.

In all games—whether poker, chess, or Catan—the interactions among the players are crucial in determining the outcome. In addition, games share three key characteristics:

1. *Rules* that determine what actions are allowable
2. *Strategies* that players employ to attain their objectives in the game
3. *Payoffs* that are the results of the interactions among the players' strategies

In business situations, the rules of the "game" include not just laws that a firm must obey but also other factors beyond a firm's control—at least in the short run—such as its production function. A **business strategy** is a set of actions that a firm takes to achieve a goal, such as maximizing profit. The *payoff* is the profit a firm earns as a result of how its strategies interact with the strategies of other firms. The best way to understand the game theory approach is to look at an example.

Business strategy A set of actions that a firm takes to achieve a goal, such as maximizing profits.

A Duopoly Game: Price Competition between Two Firms

In this simple example, we use game theory to analyze price competition in a *duopoly*—an oligopoly with two firms. We assume that Netflix and Warner Bros. Discovery's Max are the only two firms competing in the market for streaming video subscriptions. In exchange for a $15.99 per month subscription charge, the firms allow individuals to stream movies and series without commercials. (Note that in 2023, Netflix charged $15.49 per month for its plan, while Max charged $15.99. For the sake of simplicity, we're ignoring this slight difference in price.) Let's focus on the pricing decisions Netflix and Max face. We assume that the managers of the two firms have to decide whether to charge $15.99 or $19.99 for subscriptions. Which price will be more profitable depends on the price the other firm charges. Choosing a price is an example of a business strategy. In Figure 14.2, we organize the possible outcomes that result from the actions of the two firms into a **payoff matrix**, which is a table that shows the payoffs that each firm earns from every combination of strategies by the firms.

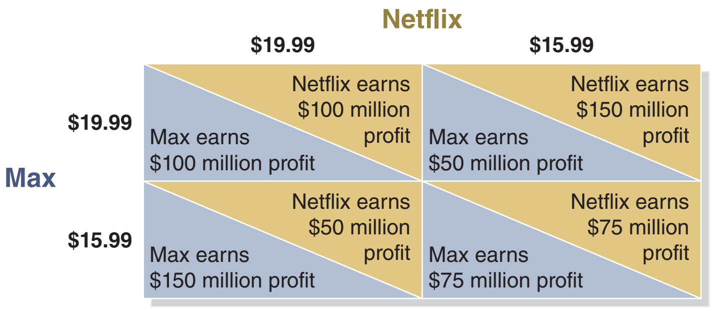
Payoff matrix A table that shows the payoffs that each firm earns from every combination of strategies by the firms.

Netflix's profit is shown in gold, and Max's profit is shown in blue. Each of the four quadrants of the payoff matrix shows the results of different combinations of strategies the two firms use. For example, if Netflix and Max both charge $19.99 per month, we are in the upper-left quadrant, which shows that each firm will make a profit of $100 million per month. The outcomes shown in Figure 14.2 are described in Table 14.2.

Clearly, the firms will be better off if they both charge $19.99 per month. But will they both charge this price? One possibility is that Netflix's managers and Max's managers will get together and *collude* by agreeing to charge the higher price. **Collusion** is an agreement among firms to charge the same price or otherwise not to compete. Unfortunately for Netflix and Max—but fortunately for their customers—collusion is against the law in the United States and Europe. The government can fine companies that collude and send the managers involved to prison.

Collusion An agreement among firms to charge the same price or otherwise not to compete.

Netflix's managers can't legally discuss their pricing decision with Max's managers, so they have to predict what the other managers will do. Suppose Netflix's managers are convinced that Max's managers will charge $19.99. In this case, Netflix's managers will definitely charge $15.99 because doing so will increase Netflix's profit from $100 million



		Netflix	
		$19.99	$15.99
Max	$19.99	Netflix earns $100 million profit Max earns $100 million profit	Netflix earns $150 million profit Max earns $50 million profit
	$15.99	Netflix earns $50 million profit Max earns $150 million profit	Netflix earns $75 million profit Max earns $75 million profit

Figure 14.2

A Duopoly Game

Max's profit is shown in blue, and Netflix's profit is shown in gold. Max and Netflix will each earn a profit of $100 million per month on video streaming subscriptions if they both charge $19.99. However, each firm has an incentive to undercut the other by charging a lower price. If both firms charge $15.99, they will each earn a profit of only $75 million per month.

Table 14.2

Prices and Profits in a Duopoly Game

If . . .	and . . .	then . . .
Netflix charges the lower price of $15.99	Max charges $19.99,	Netflix will gain many of Max's customers. Netflix's profit will be $150 million per month, and Max's profit will be only $50 million.
Max charges $15.99	Netflix charges $19.99,	Netflix's profit will be only $50 million, while Max's profit will be $150 million.
Netflix charges $15.99	Max also charges $15.99,	each company will earn a profit of $75 million per month.

to $150 million. But suppose that, instead, Netflix's managers are convinced that Max's managers will charge $15.99. Then Netflix's managers also will definitely charge $15.99 because that will increase their profit from $50 million to $75 million. In fact, regardless of which price Max's managers decide to charge, Netflix's managers are better off charging $15.99. So, we know that Netflix's managers will choose a price of $15.99 per month.

Now consider the situation from the point of view of Max's managers. They are in the same position as Netflix's managers, so we can expect them to make the same decision to charge $15.99 per month. In this situation, both firms have a *dominant strategy*. A **dominant strategy** is the best strategy for a firm, no matter what strategies other firms use. The result is an equilibrium where both firms charge $15.99 per month. This situation is an equilibrium because each firm is maximizing profit, *given the price chosen by the other firm*. In other words, neither firm can increase its profit by changing its price, given the price chosen by the other firm. An equilibrium in which each firm chooses the best strategy, given the strategies chosen by other firms, is called a **Nash equilibrium**, named after the late Nobel Laureate John Nash of Princeton University, a pioneer in the development of game theory.

Dominant strategy The best strategy for a firm, no matter what strategies other firms use.

Nash equilibrium A situation in which each firm chooses the best strategy, given the strategies chosen by other firms.

Firm Behavior and the Prisoner's Dilemma

Notice that the equilibrium in Figure 14.2 is not very satisfactory for either firm. The firms earn $75 million in profit each month by charging $15.99, but they could instead earn $100 million in profit if they both charge $19.99. By "cooperating" and charging the higher price, they would achieve a *cooperative equilibrium*. In a **cooperative equilibrium**, players cooperate to increase their mutual payoff. We have seen, though, that the outcome of this game is likely to be a **noncooperative equilibrium**, in which each firm pursues its own self-interest.

A situation like the one in Figure 14.2, in which pursuing dominant strategies results in noncooperation that leaves everyone worse off, is called a **prisoner's dilemma**. The game gets its name from the problem two suspects face when arrested for a crime. If the police lack other evidence, they may separate the suspects and offer each a reduced prison sentence in exchange for confessing to the crime and testifying against the other suspect. Because each suspect has a dominant strategy to confess to the crime, they will both confess and serve a jail term, even though they would have gone free if they had both remained silent.

Cooperative equilibrium An equilibrium in a game in which players cooperate to increase their mutual payoff.

Noncooperative equilibrium An equilibrium in a game in which players do not cooperate but pursue their own self-interest.

Prisoner's dilemma A game in which pursuing dominant strategies results in noncooperation that leaves everyone worse off.

Don't Let This Happen to You

Don't Misunderstand Why Each Firm Ends Up Charging a Price of $15.99

It is tempting to think that Netflix and Max will each charge $15.99 rather than $19.99 for a month of unlimited video streaming because each is afraid that the other firm will charge $15.99. In fact, fear of being undercut by the other firm charging a lower price is not the key to understanding each firm's pricing strategy. Notice that charging $15.99 is the most profitable strategy for each firm, regardless of which price the other firm decides to charge. For example, even if Netflix's managers somehow knew with certainty that Max's managers intended to charge $19.99, Netflix would still charge $15.99 because its profits would be $150 million instead of $100 million. Max's managers are in the same situation. That is why charging $15.99 is a dominant strategy for both firms.

Your Turn: Test your understanding by doing related problem 2.8 at the end of the chapter.

Solved Problem 14.2

Is Producing a High-Cost Series a Prisoner's Dilemma for Netflix and Max?

Netflix and Max both began as services that offered customers a convenient way to watch movies at home. Max started in the 1970s as the HBO (or Home Box Office) subscription cable television channel. Subscribers to HBO could view a movie during the time between when the movie ended its theatrical run and when it became available for sale as a videocassette or, by the 1990s, as a DVD. Like other television programming in those years, the movies HBO showed could only be viewed at scheduled times. As we saw in the chapter opener, Netflix initially offered DVD rentals through the mail by subscription.

In recent years, though, Netflix, Max, and other streaming services such as Apple TV+, Disney+, and Amazon Prime Video have attempted to attract subscribers by offering original series as well as movies. Series like *Stranger Things* on Netflix, *Game of Thrones* on Max, *The Mandalorian* on Disney+, and *The Lord of the Rings: The Rings of Power* on Amazon Prime Video are expensive to produce, costing more than $10 million per episode. These high costs contributed to Disney+ losing billions of dollars in 2022 and reduced the profits of the other firms. Each video streaming service has publicly discussed producing fewer series with each series costing less to produce—perhaps by reducing the number of special effects in each episode. But offering elaborately produced series is the key way that the services compete for subscribers.

Assume again for simplicity that Netflix and Max are the only two firms competing in the video streaming industry. Construct a payoff matrix for the firms, using the following hypothetical information:

- If both firms offer subscribers fewer, lower-cost series, each firm earns a profit of $70 million per month.
- If both firms continue to offer multiple high-cost series, each firm earns a profit of $50 million per month.
- If Netflix continues to offer multiple high-cost series while Max offers fewer, lower-cost series, Netflix earns a profit of $90 million, and Max earns a profit of $40 million.
- If Max continues to offer multiple high-cost series while Netflix offers fewer, lower-cost series, Max earns a profit of $90 million, and Netflix earns a profit of $40 million.

a. If Netflix wants to maximize profit, will it continue to offer multiple, high-cost series, or will it switch to offering fewer, lower cost series? Briefly explain.

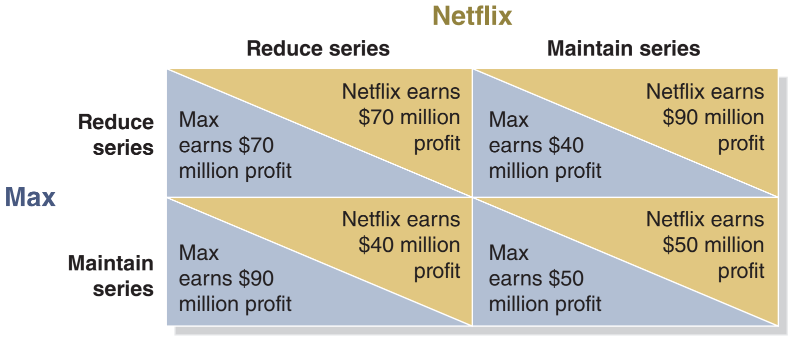
b. If Max wants to maximize profit, will it continue to offer multiple, high-cost series, or will it switch to offering fewer, lower-cost series? Briefly explain.

c. Is there a Nash equilibrium to this game? If so, what is it?

Solving the Problem

Step 1: Review the chapter material. This problem uses payoff matrixes to analyze a business situation, so you may want to review the section "A Duopoly Game: Price Competition between Two Firms."

Step 2: Construct a payoff matrix similar to the one in Figure 14.2. Your payoff matrix should look similar to this one. For the matrix labels, "Reduce series" represents the decision to offer subscribers fewer, lower-cost series, and "Maintain series" represents the decision to continue offering subscribers multiple high-cost series.



		Netflix	
		Reduce series	**Maintain series**
Max	**Reduce series**	Netflix earns $70 million profit Max earns $70 million profit	Netflix earns $90 million profit Max earns $40 million profit
	Maintain series	Netflix earns $40 million profit Max earns $90 million profit	Netflix earns $50 million profit Max earns $50 million profit

Step 3: Answer part (a) by showing that Netflix has a dominant strategy of continuing to offer subscribers multiple high-cost series. If Max doesn't continue offering high-cost series, Netflix will gain subscribers from Max and make $90 million if it continues to offer high-cost series but only $70 million

if it doesn't. If Max continues to offer high-cost series, Netflix will make $50 million if it continues offering high-cost series but will lose subscribers to Max and make only $40 million if it doesn't. Therefore, continuing to offer high-cost series is a dominant strategy for Netflix.

Step 4: **Answer part (b) by showing that Max has a dominant strategy of continuing to offer subscribers high-cost series.** Max is in the same situation as Netflix: It also has a dominant strategy of continuing to offer high-cost series.

Step 5: **Answer part (c) by showing that there is a Nash equilibrium for this game.** Both firms continuing to offer subscribers high-cost series is a Nash equilibrium. Given that Netflix is continuing to offer high-cost series, Max's best strategy is to also offer high-cost series. Given that Max is continuing to offer subscribers high-cost series, Netflix's best strategy is to also do so. Therefore, continuing to offer subscribers high-cost series is the optimal decision for both firms, *given the decision by the other firm*.

Extra Credit: This game is another example of the prisoner's dilemma. Netflix and Max would be more profitable if they both reduced the number of high-cost series they offered subscribers, because they would lower the cost—and increase the profit—from subscriptions. Each firm's dominant strategy is to continue offering subscribers the same number of high-cost series, so they end up in an equilibrium where neither company is able to reduce costs, and both earn a reduced profit. As we will see in the next section, though, there may be a way out of the prisoner's dilemma for firms in this type of situation.

Your Turn: For more practice, do related problems 2.9 and 2.10 at the end of this chapter.

Can Firms Escape the Prisoner's Dilemma?

Although the prisoner's dilemma game seems to show that cooperative behavior always breaks down, we know that people often cooperate to achieve their goals, and firms find ways to cooperate by not competing on price. The reason the basic prisoner's dilemma story is not always applicable in the real world is that it assumes the game will be played *only once*. Most business situations, however, are repeated over and over. For example, consider the following situation: Suppose that in a small town, the only places to buy a pizza are Domino's and Pizza Hut. Assume that the managers will charge either $12 or $10 for a large pepperoni pizza. Panel (a) of Figure 14.3 gives the payoff matrix. Notice that each manager has an incentive to charge the lower price. Once again, the firms appear to be caught in a prisoner's dilemma. But the managers will not play this game only once; each day they will decide again what price to charge for a pizza. In the language of game theory, the managers are playing a *repeated game*, where the losses from not cooperating are greater than in a game played only once, and players can employ *retaliation strategies* against other players who don't cooperate. As a result, firms have a greater incentive to cooperate.

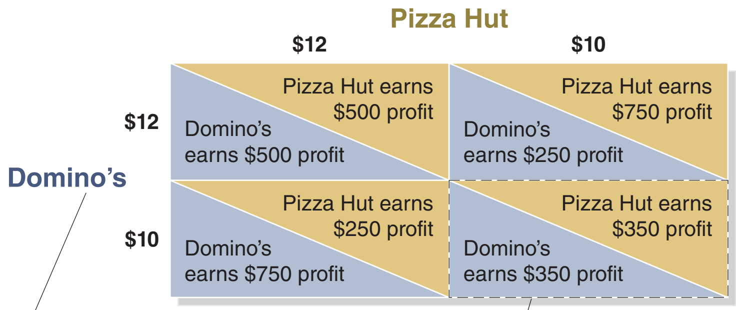
Panel (a) of Figure 14.3 shows that Domino's and Pizza Hut are earning $150 less per day by both charging $10 instead of $12 for the pizza. Every day that passes with both stores charging $10 increases the total amount lost: A year of charging $10 will cause each store to lose more than $50,000 in profit. This lost profit increases the incentive for the store managers to cooperate by *implicitly* colluding. Remember that *explicit* collusion—such as the managers meeting and agreeing to charge $12—is illegal. But if the managers can find a way to signal each other that they will charge $12, they may be within the law.

Suppose that Domino's and Pizza Hut both advertise that they will match the lowest price offered by any competitor—and in our simple example, they are each other's only competitor. These advertisements are signals to each other that they intend to charge

Figure 14.3

Changing the Payoff Matrix in a Repeated Game

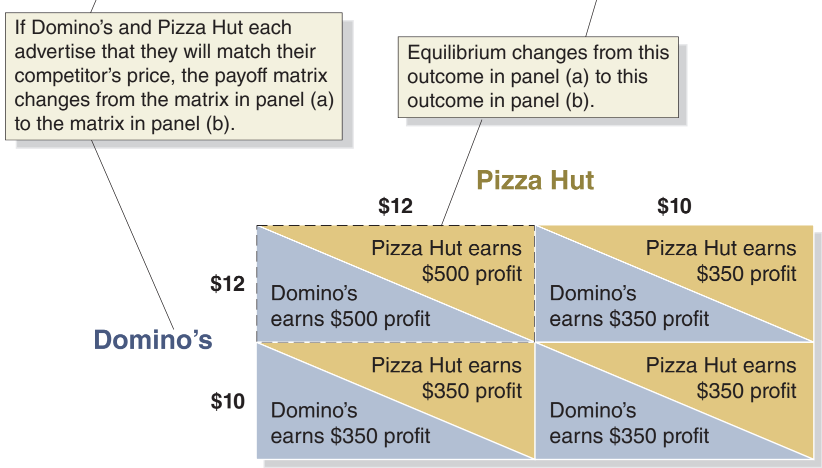
Domino's and Pizza Hut can change the payoff matrix for selling pepperoni pizzas by advertising that each will match its competitor's price. This retaliation strategy provides a signal that one restaurant charging a lower price will be met automatically by the other restaurant charging a lower price. In the payoff matrix in panel (a), there is no advertisement about matching prices, and each restaurant benefits if it charges $10 when the other charges $12. In the payoff matrix in panel (b), after advertising that they will match prices, the managers have only two choices: They can charge $12 and earn a profit of $500 per day, or they can charge $10 and earn a profit of $350 per day. The equilibrium shifts from the prisoner's dilemma result of both restaurants charging the low price and earning low profits to both restaurants charging the high price and earning high profits.


Pizza Hut
$12
$10
Domino's
$12
$10
Pizza Hut earns $500 profit
Domino's earns $500 profit
Pizza Hut earns $750 profit
Domino's earns $250 profit
Pizza Hut earns $250 profit
Domino's earns $750 profit
Pizza Hut earns $350 profit
Domino's earns $350 profit

(a) The payoff matrix with no offer to match prices

If Domino's and Pizza Hut each advertise that they will match their competitor's price, the payoff matrix changes from the matrix in panel (a) to the matrix in panel (b).

Equilibrium changes from this outcome in panel (a) to this outcome in panel (b).


Pizza Hut
$12
$10
Domino's
$12
$10
Pizza Hut earns $500 profit
Domino's earns $500 profit
Pizza Hut earns $350 profit
Domino's earns $350 profit
Pizza Hut earns $350 profit
Domino's earns $350 profit
Pizza Hut earns $350 profit
Domino's earns $350 profit

(b) The payoff matrix with an offer to match prices

$12 for a pizza. The signals are clear because each restaurant knows that if it charges $10, the other restaurant will automatically retaliate by also lowering its price to $10. The offer to match prices is a good *enforcement mechanism* because it guarantees that if either restaurant fails to cooperate and charges the lower price, the competing restaurant will automatically punish that restaurant by also charging the lower price. As Figure 14.3 shows, the restaurants have changed the payoff matrix they face.

With the original payoff matrix in panel (a), there are no advertisements about matching prices, and each restaurant makes more profit if it charges $10 when the other charges $12. The advertisements about matching prices change the payoff matrix to the one shown in panel (b). Now the managers can charge $12 and earn a profit of $500 per day, or they can charge $10 and earn a profit of $350 per day. The equilibrium shifts from the prisoner's dilemma result of both managers charging the low price and receiving a low profit to a result where both charge the high price and earn a high profit. An advertisement offering to match competitors' prices might seem to benefit consumers, but game theory shows that it actually may hurt consumers by allowing implicit collusion that keeps prices high.

Another form of implicit collusion is **price leadership**, in which one firm takes the lead in announcing a price change that other firms in the industry then match. For example, through the 1970s, General Motors (GM) would announce a price change in the fall, at the beginning of a model year, and Ford and Chrysler would match GM's price change. In some cities, one construction firm will set prices for construction jobs, and other firms will charge the same prices in an attempt to avoid competition that will lower prices, particularly when bidding on government projects. In a number of cases in recent years, this type of implicit collusion has evolved into illegal explicit collusion when construction firms have arranged to take turns winning government contracts at prearranged prices.

Price leadership A form of implicit collusion in which one firm in an oligopoly announces a price change and the other firms in the industry match the change.

Apply the Concept

Price Leadership in the Beer Market

Monticello/Shutterstock

Price leadership in the beer market reduces consumer surplus.

Congress made *explicit collusion* illegal when it passed a series of *antitrust laws* beginning in the 1890s. *Implicit collusion* is a gray area of the law because it's not always easy for the courts to draw a clear line between a business practice that is acceptable and one that is intended to allow firms to implicitly collude. The Federal Trade Commission (FTC) and the antitrust division of the Department of Justice are responsible for enforcing antitrust laws.

In their classic industrial organization textbook, F.M. Scherer of Harvard Kennedy School and David Ross of Bryn Mawr College summarize the legal status of price leadership, given court opinions from antitrust cases brought by the federal government:

> Price leadership is not apt to be found contrary to the antitrust laws unless the leader attempts to coerce other producers into following its lead, or unless there is evidence of an agreement among members of the industry to use the leadership device as the basis of a price-fixing scheme.

The FTC notes on its website the difficulty of detecting price leadership: "A uniform, simultaneous price change could be the result of price fixing, but it could also be the result of independent business responses to the same market conditions."

Nathan Miller of Georgetown University, Gloria Sheu of the Federal Reserve, and Matthew Weinberg of Ohio State University published an article in the *American Economic Review* analyzing price leadership in the beer industry. They focus on the period from 2001 to 2011, although they believe that conditions in the beer industry are similar today. From 2001 to 2007, three large U.S.-based firms—Anheuser-Busch, SABMiller, and Molson Coors—accounted for about two-thirds of beer sales in the United States. Two importers—Heineken and Grupo Modelo—accounted for about 14 percent of sales. In 2008, SABMiller and Molson Coors combined to form MillerCoors. The same year, InBev, which had a small market share, bought Anheuser Busch to form Anheuser Busch InBev (ABI). In 2011, MillerCoors and InBev together accounted for 63 percent of beer sales.

In Chapter 4, Sections 4.1 and 4.2, we introduced the concepts of *consumer surplus, producer surplus*, and *deadweight loss*. These concepts allow us to assess the effects of a change in price and quantity in a market. Price leadership results in an increase in the price of beer and a decline in the quantity of beer compared with the competitive outcome. Miller, Sheu, and Weinberg estimate that, compared with the competitive outcome, the reduction in consumer surplus in the beer market due to price leadership equaled 154 percent of the increase in producer surplus before the Miller–Coors merger and 170 percent afterward. The loss of consumer surplus is greater than the increase in producer surplus because price leadership results in a deadweight loss. Whenever collusive behavior, like price leadership, occurs in an industry, we would expect an increase in deadweight loss that will make the gains to firms larger than the losses to consumers.

ABI has acted as the price leader, announcing prices in the late summer, and MillerCoors typically matches those prices. ABI's Bud Light had the largest market share among beers in the United States in 2011, well ahead of Coors Light, which had the second-largest share. Miller, Sheu, and Weinberg find that industry profits were 17 percent above the competitive level in 2007—just before the Miller–Coors merger—and 22 percent above the competitive level in 2010—after the merger. The U.S. Department of Justice (DOJ) had decided not to contest the SABMiller and Molson Coors merger that formed MillerCoors because "cost savings in distribution likely would offset any loss of competition." But according to the authors' analysis, although the cost savings occurred, the value of the cost savings was smaller than the losses in consumer surplus resulting from reduced competition.

Your Turn: Test your understanding by doing related problems 2.14, 2.15, and 2.16 at the end of this chapter.

Cartels: The Case of OPEC

In the United States, firms cannot legally meet to agree on what prices to charge and how much to produce. But suppose they could. Would this be enough to guarantee that their collusion would be successful? The example of the Organization of the Petroleum Exporting Countries (OPEC) indicates that the answer to this question is "no." In 2023, OPEC had 13 members, including Saudi Arabia, Kuwait, and other Arab countries, as well as Iran, Venezuela, and Nigeria. Together, these countries own more than 75 percent of the world's proven crude oil reserves, although they supply only about 40 percent of the total oil produced each year. OPEC operates as a **cartel**, which is a group of firms that collude by agreeing to restrict output to increase prices and profits. The members of OPEC meet periodically and agree on quotas, which are quantities of oil that each country agrees to produce. The quotas are intended to reduce oil production well below the competitive level to force up the price of oil and increase the profits of member countries.

Cartel A group of firms that collude by agreeing to restrict output to increase prices and profits.

Figure 14.4 shows oil prices from January 1972 to mid-2023. The blue line shows the price of a barrel of oil in each year. Prices in general have risen since 1972, which has reduced the amount of goods and services that consumers can purchase with a dollar. The red line corrects for general price increases by measuring oil prices in terms of the dollar's purchasing power in June 2023. The figure shows that OPEC succeeded in raising the price of oil during the mid-1970s and early 1980s, although political unrest in the Middle East and other factors also affected the price of oil during those years. Oil prices had been below $3 per barrel in 1972 but rose to more than $39 per barrel in 1980, which was more than $125 measured in dollars of 2023 purchasing power. The figure also shows that OPEC has had difficulty sustaining the high prices of 1980 in later years, although oil prices rose sharply between 2004 and mid-2008, in part due to increasing demand from China and India. Since 2015, OPEC has also had difficulty maintaining oil prices because of a surge in U.S. production as oil companies have used "fracking" techniques to recover oil from shale deposits.

Game theory helps us understand why oil prices have fluctuated. If every member of OPEC cooperates and produces the low output level dictated by its quota, prices will be high, and the cartel will earn large profits. (Even though OPEC cannot raise prices as high as it did before U.S. production increased, it can still increase world oil prices if all of its members agree to restrict production.) Once the price has been driven up, however, each member has an incentive to stop cooperating and to earn even higher profits by

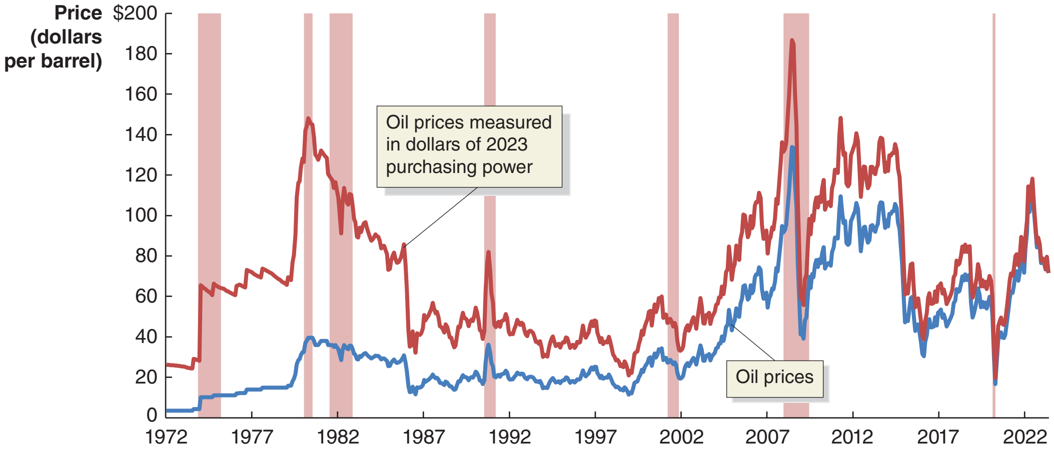
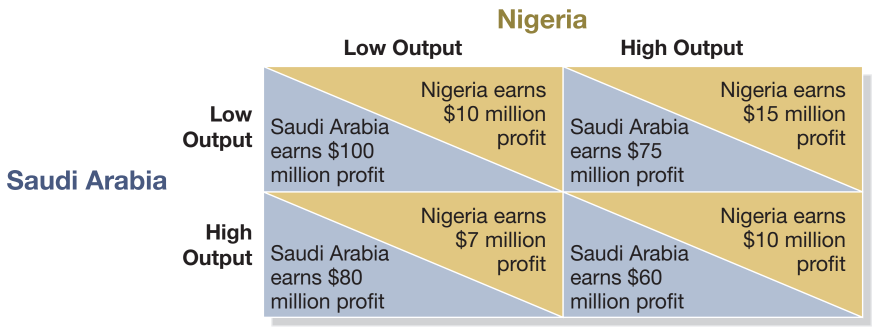


Figure 14.4 **Oil Prices, 1972 to mid-2023**

The blue line shows the price of a barrel of oil in each year. The red line measures the price of a barrel of oil in terms of the purchasing power of the dollar in 2023. By reducing oil production, OPEC was able to raise the world price of oil in the mid-1970s and early 1980s. Sustaining high prices has been difficult over the long run, however, because OPEC members often exceed their output quotas and because fracking has led to substantial increases in U.S. oil production.

Source: Federal Reserve Bank of St. Louis.



Saudi Arabia		Nigeria: Low Output	Nigeria: High Output
	Low Output	Nigeria earns $10 million profit Saudi Arabia earns $100 million profit	Nigeria earns $15 million profit Saudi Arabia earns $75 million profit
	High Output	Nigeria earns $7 million profit Saudi Arabia earns $80 million profit	Nigeria earns $10 million profit Saudi Arabia earns $60 million profit

Figure 14.5

The OPEC Cartel with Unequal Members

Because Saudi Arabia can produce much more oil than Nigeria, its output decisions have a larger effect on the price of oil. In the figure, Low Output corresponds to cooperating with the OPEC-assigned output quota, and High Output corresponds to producing at maximum capacity. Saudi Arabia has a dominant strategy to cooperate and produce a low output. Nigeria, however, has a dominant strategy not to cooperate and instead produce a high output. Therefore, the equilibrium of this game will occur with Saudi Arabia producing a low output and Nigeria producing a high output.

increasing output beyond its quota. But if no country sticks to its quota, total oil output will increase, and profits will decline. In other words, OPEC is caught in a prisoner's dilemma.

If the members of OPEC always exceeded their production quotas, the cartel would have no effect on world oil prices. In fact, the members of OPEC periodically meet and assign new quotas that, at least for a while, enable them to restrict output enough to raise prices. Two factors explain OPEC's occasional success at behaving as a cartel. First, the members of OPEC are participating in a repeated game. As we have seen, being in a repeated game increases the likelihood of a cooperative outcome. Second, Saudi Arabia has far larger oil reserves than any other member of OPEC. Therefore, it has the most to gain from high oil prices and a greater incentive to cooperate. To see this, consider the payoff matrix shown in Figure 14.5. To keep things simple, let's assume that OPEC has only two members: Saudi Arabia and Nigeria. In Figure 14.5, Low Output corresponds to cooperating with the OPEC-assigned output quota, and High Output corresponds to producing at maximum capacity. The payoff matrix shows the profits received per day by each country.

We can see that Saudi Arabia has a strong incentive to cooperate and maintain its low output quota. By keeping output low, Saudi Arabia can by itself significantly raise the world price of oil, increasing its own profits as well as those of other members of OPEC. Therefore, Saudi Arabia has a dominant strategy of cooperating with the quota and producing a low output. Nigeria, however, cannot by itself have much effect on the price of oil. Therefore, Nigeria has a dominant strategy of not cooperating and instead producing a high output. The equilibrium of this game will occur with Saudi Arabia producing a low output and Nigeria producing a high output. In fact, OPEC often operates in just this way. Saudi Arabia will cooperate with the quota, while the other 13 members produce at capacity. Because this is a repeated game, however, Saudi Arabia will occasionally produce more oil than its quota to intentionally drive down the price and retaliate against the other members for not cooperating.

14.3 Sequential Games and Business Strategies

LEARNING OBJECTIVE: Use sequential games to analyze business strategies.

We have been analyzing games in which both players move simultaneously. In many business situations, however, one firm will act first, and then other firms will respond. These situations can be analyzed using *sequential games*. We will use sequential games to analyze two business strategies: deterring entry and bargaining between firms. To keep things simple, we consider situations that involve only two firms.

Deterring Entry

In Section 14.1, we saw that barriers to entry are a key to firms continuing to earn an economic profit. Can firms create barriers to deter new firms from entering an industry? Some research in game theory has focused on this question. Suppose that Apple and

Samsung are the only makers of smartphones and that Samsung develops a foldable smartphone before Apple does. Here are three questions Samsung's managers need to consider when pricing the new smartphone:

1. **How will different prices affect the likelihood that competitors (in this case, Apple) will enter the market?** A high price might lead to a large profit if other firms do not enter the market, but if a high price attracts entry from other firms, it might actually result in a smaller profit. A low price, by deterring entry, might lead to a larger profit.
2. **What is the minimum rate of return Samsung must earn?** To break even by covering the opportunity cost of the funds used, we assume that smartphones must provide a minimum rate of return of 15 percent on Samsung's investment. If Samsung has the market for this type of smartphone to itself and charges a price of $1,500, it will earn an economic profit by receiving a return of 20 percent. If Samsung charges a price of $1,800 and has the market to itself, it will receive a higher return of 30 percent.
3. **What if Apple enters the market?** It might seem clear that Samsung should charge $1,800 for its foldable smartphones, but the managers are worried that Apple might also begin selling a foldable smartphone. If Samsung charges $1,500 and Apple enters the market, Samsung and Apple will divide up the market, and both will earn only 5 percent on their investments, which is below the 15 percent return necessary to break even. If Samsung charges $1,800 and Apple enters, although the market will still be divided, the higher price means that each firm will earn 16 percent on its investment.

Samsung and Apple are playing a sequential game because Samsung makes the first move—deciding what price to charge—and Apple responds. We can analyze a sequential game by using a *decision tree*, like the one shown in Figure 14.6. The boxes in the figure represent *decision nodes*, which are points where the firms must make the decisions contained in the boxes. On the left side, Samsung makes the initial decision of what price to charge, and then Apple responds by either entering the market or not. The decisions made are shown beside the arrows. The *terminal nodes*, in green at the right side of the figure, show the resulting rates of return.

Let's start with Samsung's initial decision. If Samsung charges $1,800, then the arrow directs us to the upper gold decision node for Apple. If Apple decides to enter the market, it will earn a 16 percent rate of return on its investment, which represents an economic profit because it is above the opportunity cost of the funds invested. If Apple doesn't

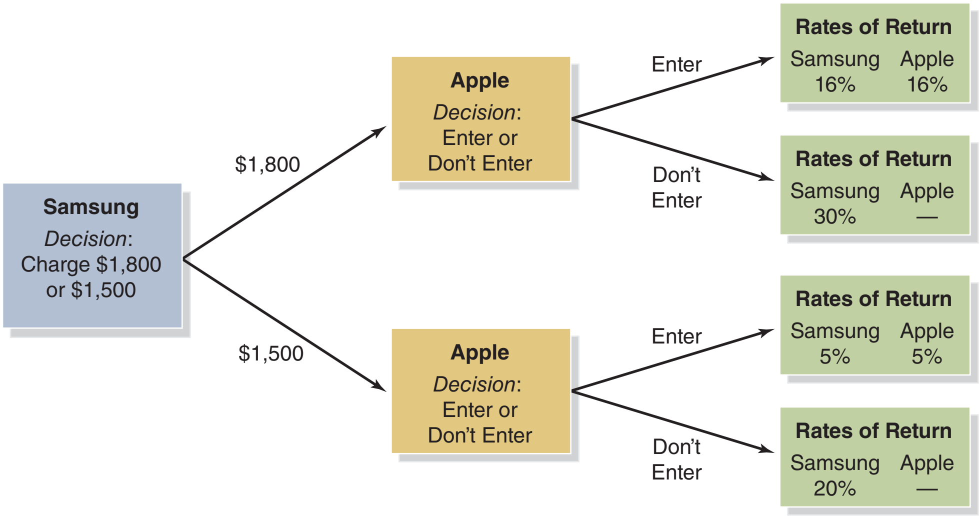


Figure 14.6

The Decision Tree for an Entry Game

Samsung earns its highest return if it charges $1,800 for its foldable smartphone and Apple doesn't enter the market. But at that price, Apple will enter the market, and Samsung will earn only 16 percent. If Samsung charges $1,500, Apple won't enter because Apple will suffer an economic loss by earning only a 5 percent return on its investment. Therefore, Samsung's best decision is to deter Apple's entry by charging $1,500. Samsung will earn an economic profit by earning a 20 percent return on its investment. Note that the dashes (–) indicate the situation where Apple doesn't enter the market and so makes no investment and earns nothing in this market.

enter, Samsung will earn 30 percent, and Apple will not earn anything in this market (indicated by the dash). Samsung's managers can conclude that if they charge $1,800 for their smartphones, Apple will enter the foldable smartphone market, and both firms will earn 16 percent on their investments.

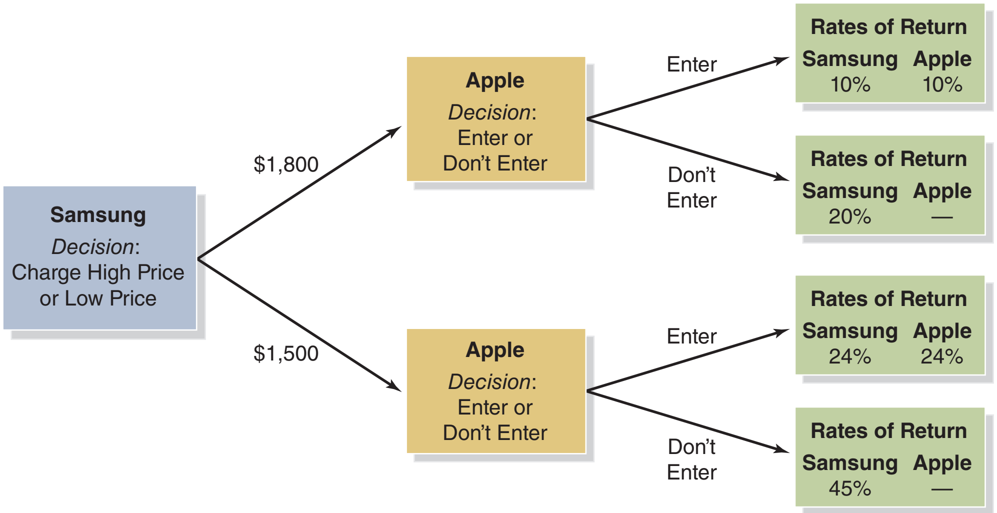
If Samsung decides to charge $1,500, then the arrow directs us to the lower gold decision node for Apple. If Apple decides to enter, it will earn only a 5 percent rate of return. If it doesn't enter, Samsung will earn 20 percent, and Apple will not earn anything in this market. Samsung's managers can conclude that if they charge $1,500, Apple will not enter, and Samsung will earn 20 percent on its investment.

This analysis should lead Samsung's managers to conclude that they can charge $1,800 and earn 16 percent—because Apple will enter—or they can charge $1,500 and earn 20 percent by deterring Apple's entry. Using a decision tree helps Samsung's managers make the correct choice and charge $1,500 to deter Apple's entry into this market. Note that our discussion is simplified because we are ignoring other characteristics, apart from price, on which the firms also compete. In practice, Samsung charged a relatively high price when it introduced its foldable smartphone, the Fold. (Samsung also introduced a smaller foldable smartphone, the Flip.) The high price made it more likely that Apple would enter the foldable smartphone market, which industry analysts expect it to do by 2024. (Analysts who evaluated the patent applications that Apple filed expected Apple's foldable smartphone to be similar to Samsung's Fold, rather than its Flip.) Managers at Samsung were confident that the Fold's features would remain attractive to consumers in comparison with the features Apple would offer on a foldable smartphone should it enter the market.

Solved Problem 14.3

Is Deterring Entry Always a Good Idea?

Like any other business strategy, deterring entry is a good idea only if it has a higher payoff than alternative strategies. Use the following decision tree to decide whether Samsung should deter Apple from entering the market for foldable smartphones. Assume that each firm must earn a 15 percent return on its investment to break even.


Samsung
Decision: Charge High Price or Low Price
$1,800
$1,500
Apple
Decision: Enter or Don't Enter
Apple
Decision: Enter or Don't Enter
Enter
Don't Enter
Enter
Don't Enter
Rates of Return
Samsung Apple
10% 10%
Rates of Return
Samsung Apple
20% —
Rates of Return
Samsung Apple
24% 24%
Rates of Return
Samsung Apple
45% —

Solving the Problem

Step 1: Review the chapter material. This problem is about sequential games, so you may want to review the section "Deterring Entry."

Step 2: Determine how Apple will respond to Samsung's decision. If Samsung charges $1,800 for its foldable smartphones, Apple will not enter the market because the return on its investment represents an economic loss. If Samsung charges $1,500, Apple will enter because it will earn a return that represents an economic profit.

Step 3: Given how Apple will react, determine which strategy maximizes profit for Samsung. If Samsung charges $1,800, it will deter Apple's entry, and the rate of return on its investment will be 20 percent. If Samsung charges $1,500, Apple will enter, but because these low prices will substantially increase the market for foldable smartphones, Samsung will actually earn a higher return of 24 percent. By splitting the market with Apple at a lower price, Samsung earns a higher return than it would have with the whole market to itself at a high price.

Step 4: State your conclusion. Like any other business strategy, deterrence is worth pursuing only if the payoff is higher than the payoffs for other strategies. In this case, expanding the market for foldable smartphones by charging a lower price has a higher payoff for Samsung, even given that Apple will enter the market.

Your Turn: For more practice, do related problem 3.4 at the end of this chapter.

Bargaining

The success of many firms depends on how well they bargain with other firms. For example, firms often must bargain with their suppliers over the prices they pay for inputs. Suppose that TruImage is a small firm that has developed software that improves how pictures from digital cameras or smartphones are displayed on computer screens. TruImage currently sells its software only on its website and earns a profit of $2 million per year. Dell informs TruImage that it is considering installing the software on every new computer Dell sells. Dell expects to sell more computers at a higher price if it can install TruImage's software on its computers. The two firms begin bargaining over what price Dell will pay TruImage for its software.

The decision tree in Figure 14.7 illustrates this bargaining game. At the left, Dell makes the initial decision about what price to offer TruImage for its software, and then TruImage responds by either accepting or rejecting the contract offer. Suppose that Dell offers TruImage a contract price of $30 per copy for its software. If TruImage accepts this contract, its profit will be $5 million per year, and Dell will earn $10 million in additional profit. If TruImage rejects the contract, its profit will be the $2 million per year it earns selling its software on its website, and Dell will earn zero additional profit.

Now, suppose Dell offers TruImage a contract price of $20 per copy. If TruImage accepts this contract, its profit will be $3 million per year, and Dell will earn $15 million

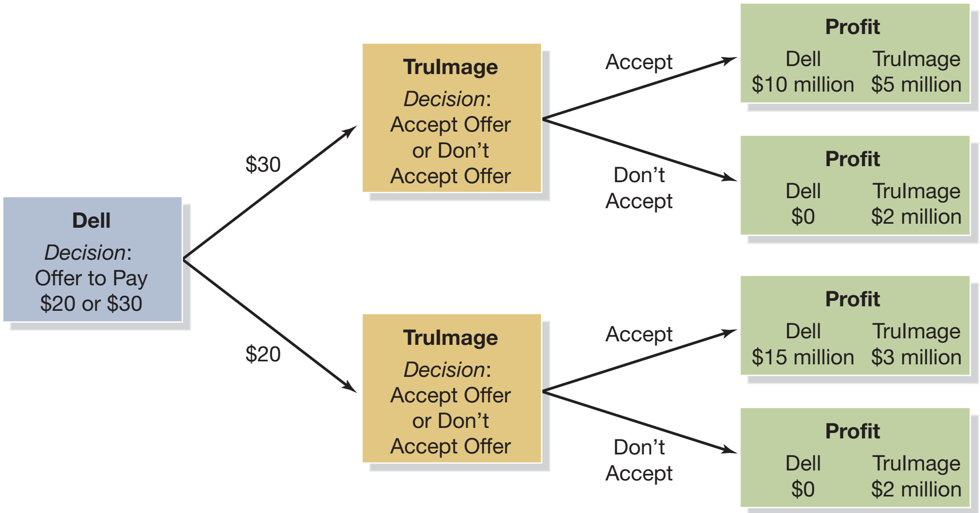


Figure 14.7

The Decision Tree for a Bargaining Game

Dell earns the highest profit if it offers a contract price of $20 per copy and TruImage accepts the contract. TruImage earns the highest profit if Dell offers it a contract of $30 per copy and it accepts the contract. TruImage may attempt to bargain by threatening to reject a $20-per-copy contract. But Dell knows this threat is not credible because once Dell has offered a $20-per-copy contract, TruImage's profits are higher if it accepts the contract than if it rejects it.

in additional profit. If TruImage rejects this contract, its profit will be the $2 million it earns selling its software on its website, and Dell will earn zero additional profit. Clearly, for Dell, a contract price of $20 per copy is more profitable, while for TruImage, a contract price of $30 per copy is more profitable.

Suppose TruImage attempts to obtain a favorable outcome from the bargaining by telling Dell that it will reject a $20-per-copy contract price. If Dell believes this threat, then it will offer TruImage a $30-per-copy contract price because Dell is better off with the $10 million additional profit that will result from TruImage accepting the contract than with the zero additional profit Dell will earn if TruImage rejects the $20-per-copy contract price. This result is a Nash equilibrium because neither firm can increase its profit by changing its choice—*provided that Dell believes TruImage's threat*. But is TruImage's threat credible? Once Dell has offered TruImage the $20-per-copy contract price, TruImage's choices are to accept the contract and earn $3 million or reject the contract and earn only $2 million. Because rejecting the contract reduces TruImage's profit, TruImage's threat to reject the contract is not credible, and Dell should ignore it.

As a result, we would expect Dell to use the strategy of offering TruImage a $20-per-copy contract price and TruImage to use the strategy of accepting the contract. Dell will earn an additional profit of $15 million per year, and TruImage will earn a profit of $3 million per year. This outcome is called a *subgame-perfect equilibrium*. A subgame-perfect equilibrium is a Nash equilibrium in which no player can make himself or herself better off by changing his or her decision at any decision node. In our simple bargaining game, each player has only one decision to make. As we have seen, Dell's profits are highest if it offers the $20-per-copy contract price, and TruImage's profits are highest if it accepts the contract. Typically, in sequential games of this type, there is only one subgame-perfect equilibrium.

Managers use decision trees like those in Figures 14.6 and 14.7 in business planning because they provide a systematic way of thinking through the implications of a strategy and of predicting the reactions of rivals. We can see the benefits of decision trees in the simple examples considered here. In the first example, Apple's managers can conclude that charging a low price is more profitable than charging a high price. In the second example, Dell's managers can conclude that TruImage's threat to reject a $20-per-copy contract is not credible.

14.4

The Five Competitive Forces Model

LEARNING OBJECTIVE: Use the five competitive forces model to analyze competition in an industry.

We have seen that the number of competitors in an industry affects a firm's ability to charge a price above average total cost and earn an economic profit. The number of firms is not the only determinant of the level of competition in an industry, however. Michael Porter of Harvard Business School has developed a model that shows how five competitive forces determine the overall level of competition in an industry.

In this section, we briefly discuss each of the five competitive forces: (1) competition from existing firms, (2) the threat from potential entrants, (3) competition from substitute goods or services, (4) the bargaining power of buyers, and (5) the bargaining power of suppliers.

Competition from Existing Firms

We have already seen that competition among firms in an industry can lower prices and profits. Consider another example: Educational Testing Service (ETS) administers the Scholastic Aptitude Test (SAT) (although the test is owned and developed by the College Board) and the Graduate Record Exam (GRE). High school students applying to college take the SAT, and college students applying to graduate school take the GRE. In 2023, ETS charged a price of $60 to take the SAT, and it charged $220 to take the GRE. Part of the explanation for this large price difference is that ETS faces competition in the market for tests given to high school students applying to college, where the SAT competes with the ACT test, produced by ACT, Inc. The price to take the ACT was $60. But there is no competition for the GRE. As we saw in Section 14.2, when there are only a few firms in a market, it is easier for them to implicitly collude and to charge a price close to the monopoly price. In this case, however, competition from a single firm was enough to cause ETS to keep the price of the SAT near the competitive level.

Competition in the form of advertising, better customer service, or longer warranties can also reduce profits by raising costs. In recent years, several restaurant chains, including Panera Bread, Chipotle Mexican Grill, and McDonald's, have felt competitive pressure to reduce or eliminate food containing additives, and meat and poultry that have been fed antibiotics or raised under inhumane conditions. Restaurants face higher costs to make these changes, which can reduce their profits.

The Threat from Potential Entrants

Firms face competition from companies that currently are not in the market but might enter it. We have already seen how actions taken to deter entry can reduce profits. In our hypothetical example in the previous section, Samsung charged a lower price and earned less profit to deter Apple's entry into the foldable smartphone market. Business managers often take actions aimed at deterring entry. Some of these actions include advertising to create product loyalty, introducing new products—such as slightly different cereals or toothpastes—to fill market niches, and setting lower prices to keep profits at a level that makes entry less attractive. For example, Spotify had hoped to deter Apple's entry into the market for streaming music by keeping its monthly subscription price at $9.99—a price at which it struggled to earn a profit. Apple entered the market anyway. Apple was willing to match the $9.99 per month price, although in October 2022 it raised the price to $10.99 per month.

Competition from Substitute Goods or Services

A firm is always vulnerable to a competitor introducing a new product that fills a consumer need better than the current product does. Consider the camera business. Film cameras first became widely available in the early 1900s, when George Eastman introduced the Kodak Brownie. Sales of film cameras and camera film continued to increase through the 1980s. But the development of digital cameras in the 1990s caused a collapse in the markets for film cameras and for film, and Kodak declared bankruptcy in 2013. Digital camera sales peaked in 2010 with about 120 million cameras sold. As smartphones with cameras became increasingly popular and as their ability to take high-quality photos continuously improved, sales of digital cameras plummeted. By 2023, sales of digital cameras had fallen to less than 8 million—bad news for digital camera makers such as Canon, Nikon, and Olympus.

The Bargaining Power of Buyers

If buyers have enough bargaining power, they can insist on lower prices, higher-quality products, or additional services. Automobile companies, for example, have significant bargaining power in the tire market, which tends to lower tire prices and limit the profitability of tire manufacturers. Some retailers have significant buying power over their suppliers. For instance, Walmart has required many of its suppliers to alter their distribution systems because it wants to reduce the inventories it holds in its warehouses. In the face of online competition from Amazon, Walmart pushed for price cuts from even its largest suppliers, such as Procter & Gamble, which makes household products including Tide laundry detergent and Crest toothpaste.

The Bargaining Power of Suppliers

If many firms can supply an input and the input is not specialized, the suppliers are unlikely to have the bargaining power to limit a firm's profit. For instance, suppliers of paper napkins to McDonald's restaurants have very little bargaining power. With only a single or a few suppliers of an input, however, the purchasing firm may face a high price. During the 1930s and 1940s, for example, the Technicolor Company was the only producer of the cameras and film that studios needed to produce color movies. Technicolor charged the studios high prices to use its cameras, and it had the power to insist that only its technicians could operate the cameras. The only alternative for the studios was to make black-and-white movies.

As with other competitive forces, the bargaining power of suppliers can change over time. For instance, when IBM chose Microsoft to supply the operating system for its personal computers, Microsoft was a small company with very limited bargaining power. As Microsoft's Windows operating system became standard in more than 90 percent of personal computers, this large market share increased Microsoft's bargaining power with computer manufacturers.

Apply the Concept

Do Large Firms Live Forever?

GOING OUT OF BUSINESS
TOYS R US

NorthWindPub/Alamy Stock Photo

In 2018, Toys "R" Us filed for bankruptcy and closed all its stores.

Even before the Covid–19 pandemic, it was typical for a restaurant to go out of business within a year of opening. The failure rate for other small businesses is also high; more than 50 percent fail within five years of opening. The intense competition from existing firms and from new entrants helps to explain why many small businesses survive for just a few years. In contrast, many people believe that large businesses survive for decades and can charge consumers high prices indefinitely because of limited competition.

In fact, although large firms may dominate an industry for a period of years, over the long run, competition from new entrants will often undermine the ability of even large firms to charge high prices and will sometimes drive them out of business. Each year, *Fortune* magazine lists the 500 largest U.S. public corporations, ranked by revenue. Only 53 of the firms that were on the list in 1955 are still on it today. Many of the firms that dropped off the list no longer exist, including Bethlehem Steel and Republic Steel, which were once the second- and third-largest steel firms in the United States, and American Motors, which was the fourth-largest automobile manufacturer. Other firms that dropped off the list have survived but are no longer large or profitable, including Eastman Kodak, which in 1955 was the largest producer of photographic film in the world, and Zenith, which was the second-largest manufacturer of television sets in the world. On average, a firm that makes it into the Fortune 500 remains there for only about 16 years.

We saw in Chapter 8, Section 8.2, that the S&P 500 is a stock market index of 500 large firms that each has a stock market value of at least $5 billion. The firms in this index have also changed significantly over time. A study by the consulting firm Innosight estimated that over half the firms currently in the S&P 500 would no longer be included in 10 years. A study by the investment bank Credit Suisse found that between 2000 and 2016 alone, 139 firms dropped out of the S&P 500 index because they had failed and gone out of business. Another 237 firms dropped out of the index because they had merged with or been acquired by other firms. In some of these cases, the firm would have failed if it had not found another firm to buy it or merge with it.

The high failure rates even among large, oligopolistic firms indicate how barriers to entry can break down over time, particularly as consumer preferences change and as technological progress makes possible the introduction of new products and new ways of making products. Commenting on turnover in the Fortune 500 list, economist Mark Perry of the University of Michigan, Flint observed that "the process of market disruption is being driven by the endless pursuit of sales and profits that can only come from serving customers with low prices, high-quality products and services, and great customer service."

As we've seen, the market acts on firms the way that natural selection acts on biological organisms. The result is that in the long run, even successful firms have their positions undermined by competition. Or, as the late economist Kenneth Boulding once starkly put it, firms follow an "inexorable and irreversible movement towards the equilibrium of death."

Your Turn: Test your understanding by doing related problem 4.7 at the end of this chapter.

Continued from chapter opener

Economics in Your Life & Career

If You Were Managing a Walmart, Would You Cut the Price of a PlayStation 5?

At the beginning of this chapter, we asked you to assume that you are a manager at Walmart, and your assistant manager proposes cutting the price of a PlayStation 5 game console from $490 to $440. The assistant manager thinks that the price cut will increase profit by attracting some consumers who would otherwise buy the game console from Best Buy, Target, or Amazon. In this chapter, we have seen that managers of large firms may be tempted to charge low prices in an attempt to attract customers from other firms, but such a strategy invites retaliation from those firms. If all firms cut their prices—in this case, from $490 to $440—they will likely all end up reducing their profits. In game theory, this result is called a prisoner's dilemma. Because pricing a PlayStation 5 is actually a repeated game with the retailers involved selling the game console in competition over a long period of time, a better strategy for you is to reject the proposal and maintain the $490 price. The result will be a cooperative equilibrium, in which the firms all charge a high price—a result that is good news for the profits of Walmart and its competitors but bad news for consumers!

Conclusion

Firms are locked in a never-ending struggle to earn an economic profit. One of the most important lessons of economics is that competition erodes economic profits. Even in the oligopolies discussed in this chapter, firms have difficulty earning an economic profit in the long run. We have seen that firms attempt to avoid the effects of competition in various ways: For example, they can occupy a secure niche in the market based on control of a scarce input, they can engage in implicit collusion with competing firms, or they can try to persuade the government to impose barriers to entry.

CHAPTER SUMMARY AND PROBLEMS

Key Terms

Barrier to entry, p. 487
Business strategy, p. 491
Cartel, p. 497
Collusion, p. 491
Cooperative equilibrium, p. 492
Dominant strategy, p. 492
Economies of scale, p. 487
Game theory, p. 490
Nash equilibrium, p. 492
Noncooperative equilibrium, p. 492
Oligopoly, p. 486
Patent, p. 489
Payoff matrix, p. 491
Price leadership, p. 495
Prisoner's dilemma, p. 492

14.1 Oligopoly and Barriers to Entry

LEARNING OBJECTIVE: Show how barriers to entry explain the existence of oligopolies.

Summary

An **oligopoly** is a market structure in which a small number of interdependent firms compete. **Barriers to entry** keep new firms from entering an industry. The three most important barriers to entry are economies of scale, ownership of a key input, and government barriers. Economies of scale are the most important barrier to entry. **Economies of scale** exist when a firm's long-run average cost falls as it increases output. Government barriers include patents, licensing, and barriers to international trade. A **patent** is the exclusive legal right to a product for a period of 20 years from the date the patent application is filed with the government.

Review Questions

1.1 What is an oligopoly? Give three examples of oligopolistic industries in the United States.

1.2 How do barriers to entry affect the extent of competition in an industry? What is the most important reason that some industries, such as streaming video, are dominated by just a few firms?

1.3 Give an example of a government-imposed barrier to entry. Why would a government be willing to erect barriers to firms entering an industry?

Problems and Applications

1.4 Michael Porter has argued that "the intensity of competition in an industry is neither a matter of coincidence nor bad luck. Rather, competition in an industry is rooted in its underlying economic structure." What does Porter mean by "economic structure"? What factors besides economic structure might be expected to determine the intensity of competition in an industry?

1.5 The *Wall Street Journal* reported that the Biden administration had accused the largest meat companies in the United States of "using their market power to increase prices for restaurants and supermarkets. . . . The four largest companies control an estimated 85% of beef production and 54% of poultry, according to the White House." Four-firm concentration ratios measure the fraction of an industry's sales accounted for by the four largest firms.

- **a.** According to this chapter, why do the four-firm concentration ratios imply that the beef and poultry industries are oligopolies?
- **b.** Barriers to entry are a key reason for the existence of oligopolistic industries. Briefly describe three types of barriers to entry.
- **c.** Which of the three barriers to entry from (b) helps explain why the beef and poultry industries are oligopolies?

1.6 An article in the *Wall Street Journal* quoted a business consultant as saying, "Today, companies are trying to get bigger to get economies of scale."

- **a.** What are economies of scale?
- **b.** What benefits might a firm receive from attaining economies of scale before competing firms in the industry do?
- **c.** Suppose you open a new restaurant in Los Angeles. Can you use economies of scale as a barrier to entry so that your restaurant will be profitable in the long run? Briefly explain.

1.7 A column on bloomberg.com discusses whether tech firms like Google, Apple, Facebook, and Amazon will be able to maintain their high market shares indefinitely. The column notes that the firms "argue that their dominance is hardly durable because barriers to entry are low for new competitors. As Google is fond of saying, competition is just 'one click away.'"

- **a.** What does the columnist mean by "barriers to entry"? Name one barrier to entry a new firm would face in competing with:
  - **i.** Google in online advertising
  - **ii.** Apple in smartphones
  - **iii.** Facebook in social media apps
  - **iv.** Amazon in online retailing
- **b.** For each barrier to entry you identified in part (a), briefly discuss whether technological change is likely to reduce the importance of the barrier in the long run.

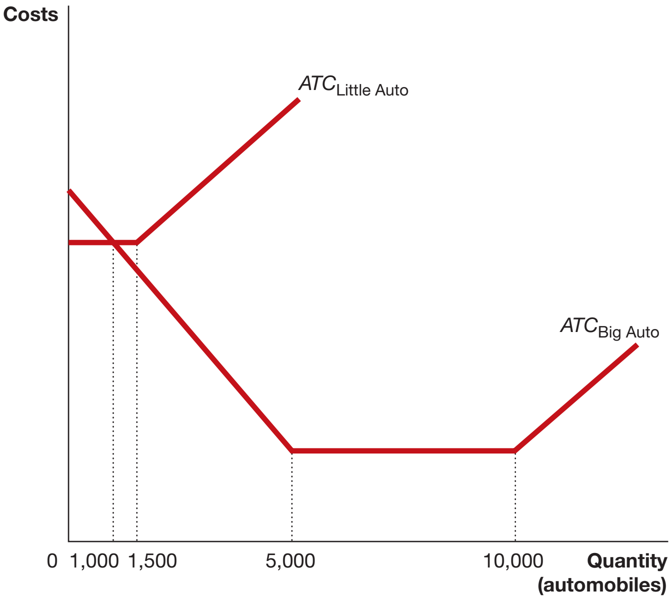
1.8 An article on barrons.com quoted an industry analyst as describing video streaming as an "internet-driven [industry] where low switching costs, low barriers to entry, higher price transparency, and rapid innovation create a more dynamic playfield."

- **a.** What does the analyst mean by characterizing video streaming as being an "internet-driven" industry?
- **b.** What does the analyst mean by "low switching costs"? Who is doing the switching?

- **c.** Do you agree that barriers to entry are low in the video streaming industry? Are the barriers as low as in, for example, the restaurant industry?
- **d.** If the analyst is correct, what are the implications for the degree of competition in the video streaming industry in the long run?

1.9 The late Thomas McCraw of Harvard Business School once wrote, "Throughout American history, entrepreneurs have tried, sometimes desperately, to create big businesses out of naturally small-scale operations. It has not worked." What advantage would entrepreneurs expect to gain from creating "big businesses"? Why would entrepreneurs fail to create big businesses out of "naturally small-scale operations"? Illustrate your answer with a graph showing long-run average costs.

1.10 The following graph illustrates the average total cost curves for two automobile manufacturing firms: Little Auto and Big Auto. Under which of the following conditions would you expect to see the market composed of firms like Little Auto, and under which conditions would you expect to see the market dominated by firms like Big Auto?



- **a.** When the market demand curve intersects the quantity axis at fewer than 1,000 units
- **b.** When the market demand curve intersects the quantity axis at more than 1,000 units but fewer than 10,000 units
- **c.** When the market demand curve intersects the quantity axis at more than 10,000 units

1.11 Alfred Chandler, who was a professor at Harvard Business School, once observed, "Imagine the diseconomies of scale—the great increase in unit costs—that would result from placing close to one-fourth of the world's production of shoes, or textiles, or lumber into three factories or mills!" The shoe, textile, and lumber industries are very competitive, with many firms producing each of these products. Briefly explain how Chandler's observation helps explain why these industries are competitive.

1.12 **[Related to the Apply the Concept "Are Unlicensed Yoga Instructors a Menace to Public Health?"]** In Florida, it is illegal for anyone who isn't a state-licensed dietitian to accept payment for providing nutritional advice—such as recommending that someone follow a particular diet and supervising the person's progress in following the diet. Becoming a licensed dietitian in Florida requires earning a bachelor's degree in dietetics, obtaining 900 hours of practice under supervision by a licensed dietitian, passing an exam, and paying fees. An opinion column in a Florida newspaper notes that many states don't have such licensing laws and argues, "The reality is that licensed dietitians are mostly trying to protect their own turf."

- **a.** Predict the effect on the price and quantity of nutritional advice offered in Florida if the Florida legislature repeals the requirement that only licensed dietitians provide such advice.
- **b.** Can we be sure that the result of the decision will be to increase the well-being of consumers of nutritional advice in Florida? Briefly explain.

14.2 Game Theory and Oligopoly

LEARNING OBJECTIVE: Use game theory to analyze the strategies of oligopolistic firms.

Summary

Because an oligopoly has only a few firms, interactions among those firms are particularly important. **Game theory** is the study of how people make decisions in situations in which attaining their goals depends on their interactions with others; in economics, it is the study of the decisions of firms in industries where the profits of each firm depend on its interactions with other firms. A **business strategy** refers to actions taken by a firm to achieve a goal, such as maximizing profit. Oligopoly games can be illustrated with a **payoff matrix**, which is a table that shows the payoffs that each firm earns from every combination of strategies by the firms. One possible outcome in oligopoly is **collusion**, which is an agreement among firms to charge the same price or otherwise not to compete. A **cartel** is a group of firms that collude by agreeing to restrict output to increase prices and profits. In a **cooperative equilibrium**, firms cooperate to increase their mutual payoff. In a **noncooperative equilibrium**, firms do not cooperate but pursue their own self-interests. A **dominant strategy** is the best strategy for a firm, no matter what strategies other firms choose. A **Nash equilibrium** is a situation in which each firm chooses the best strategy, given the strategies chosen by other firms. A situation in which pursuing dominant strategies results in noncooperation that leaves everyone worse off is called a **prisoner's dilemma**. Because many business situations are repeated games, firms may end up implicitly colluding to keep prices high. With **price leadership**, one firm takes the lead in announcing a price change, which is then matched by the other firms in the industry.

Review Questions

2.1 Give brief definitions of the following concepts.
- **a.** Game theory
- **b.** Cooperative equilibrium
- **c.** Noncooperative equilibrium
- **d.** Dominant strategy
- **e.** Nash equilibrium
- **f.** Price leadership

2.2 Why do economists refer to the methodology for analyzing oligopolies as *game theory*?

2.3 What is the difference between explicit collusion and implicit collusion? Give an example of each. What is a cartel?

2.4 What is a prisoner's dilemma game? Is the outcome of the game likely to be different in a repeated game? Briefly explain.

Problems and Applications

2.5 Bob and Tom have been arrested for burglary. The police put Bob and Tom in separate cells. They offer to let Bob go free if he confesses to the crime and testifies against Tom. Bob also is told that he will serve a 15-year prison sentence if he remains silent while Tom confesses. If Bob confesses and Tom also confesses, they will each serve a 10-year sentence. Separately, the police make the same offer to Tom. Assume that Bob and Tom know that if they both remain silent, the police have only enough evidence to convict them of a lesser crime, and they will both serve 3-year sentences.
- **a.** Use the information provided to write a payoff matrix for Bob and Tom.
- **b.** Does Bob have a dominant strategy? If so, what is it?
- **c.** Does Tom have a dominant strategy? If so, what is it?
- **d.** What prison sentences do Bob and Tom serve? How might they have avoided this outcome?

2.6 Under "early decision" college admission plans, students apply to a college in the fall and, if they are accepted, they must enroll in that college. Some critics of early decision plans, including some college presidents, argue that the plans put too much pressure on students to decide early in their senior year in high school which college to attend. Some college administrators have proposed abolishing early decision plans, though as an article in the *Wall Street Journal* noted, "In 2006, Princeton and Harvard dropped their early-decision options . . . [but] when peer schools didn't follow suit and continued snapping up top students early, they reintroduced slightly more flexible versions of the programs." Another article in the *Wall Street Journal* quoted the vice president for enrollment at Colorado College as saying, "We're all pushing early decision now. This is a runaway train and it's not going to stop." If many college administrators believe that early decision plans should be abolished, why in 2023 were most schools continuing to use them? Can game theory help you analyze this situation? Briefly explain.

2.7 For several years, a professor at Johns Hopkins University used the following grading scheme for his final exam: He would give an A to the student with the highest score. The grades of the remaining students were then based on how their scores compared with the top student's score. But at the end of one semester, the students in his class decided to boycott the final exam. They stood in the hallway outside the classroom but did not enter the room to take the exam. After waiting for a time, the professor cancelled the exam and, applying his grading scale, gave everyone in the class an A on the exam. An article in the *New York Times* about this incident observes: "This is an amazing game theory outcome, and not one that economists would likely predict." Do you agree with this observation that game theory indicates the students' strategy was unlikely to work? Briefly explain.

2.8 **[Related to the Don't Let This Happen to You]** A student argues, "The prisoner's dilemma game is unrealistic. Each player's strategy is based on the assumption that the other player won't cooperate. But if each player assumes that the other player *will* cooperate, the 'dilemma' disappears." Briefly explain whether you agree with this argument.

2.9 **[Related to Solved Problem 14.2]** Coca-Cola and PepsiCo both spend large amounts on advertising, but would they be better off if they didn't? Their television commercials and online ads are usually not designed to convey new information about their products. Instead, they are designed to capture each other's customers. Construct a payoff matrix using the following hypothetical information:
- If neither firm advertises, Coca-Cola and PepsiCo each earn a profit of $750 million per year.
- If both firms advertise, Coca-Cola and Pepsi each earn a profit of $500 million per year.
- If Coca-Cola advertises and PepsiCo doesn't, Coca-Cola earns a profit of $900 million, and Pepsi earns a profit of $400 million.
- If Pepsi advertises and Coca-Cola doesn't, PepsiCo earns a profit of $900 million, and Coca-Cola earns a profit of $400 million.
  - **a.** If Coca-Cola wants to maximize profit, will it advertise? Briefly explain.
  - **b.** If PepsiCo wants to maximize profit, will it advertise? Briefly explain.
  - **c.** Is there a Nash equilibrium to this advertising game? If so, what is it?

2.10 **[Related to Solved Problem 14.2]** Elizabeth Holmes founded the biotech firm Theranos in 2003 to manufacture what she claimed would be a revolutionary blood-testing device. The company went out of business in 2018, and federal prosecutors said that Holmes and the firm's CEO, Ramesh Balwani, had "lied to doctors and patients about test results and deceived investors about the company's finances." Before the trial on these charges started in 2021, an article on bloomberg.com argued that Holmes and Balwani "confront a proverbial prisoner's dilemma: stand together to fight prosecutors, or point fingers at each other."

a. Do you agree that Holmes and Balwani faced a prisoner's dilemma? Briefly explain.

b. Construct a payoff matrix using hypothetical prison terms of different lengths to illustrate your answer to part (a).

2.11 World War I began in August 1914 and on the Western Front quickly bogged down into trench warfare. In Belgium and northern France, British and French troops were dug into trenches facing German troops a few hundred yards away. The troops continued firing back and forth until a remarkable event occurred, which historians have labeled "The Christmas Truce." On Christmas Eve, along several sectors of the front, British and German troops stopped firing and eventually came out into the area between the trenches to sing Christmas carols and exchange small gifts. The truce lasted until Christmas night in most areas of the front, although it continued until New Year's Day in a few areas. Most of the troops' commanding officers were unhappy with the truce—they would have preferred the troops to keep fighting through Christmas—and in the future they often used a policy of rotating troops around the front so that the same British and German troops did not face each other for more than relatively brief periods. Can game theory explain why the Christmas Truce occurred? Can game theory help explain why the commanding officers' strategy was successful in reducing future unauthorized truces?

2.12 In 2023, Best Buy had the following price matching policy posted on its website: "We match local retail competitors (including their online prices) and these qualifying online retailers: Amazon.com, Crutchfield.com, Dell.com, and HP.com." Is Best Buy's policy likely to result in lower prices or higher prices on televisions and other products it sells in competition with Amazon and local brick-and-mortar stores? Briefly explain.

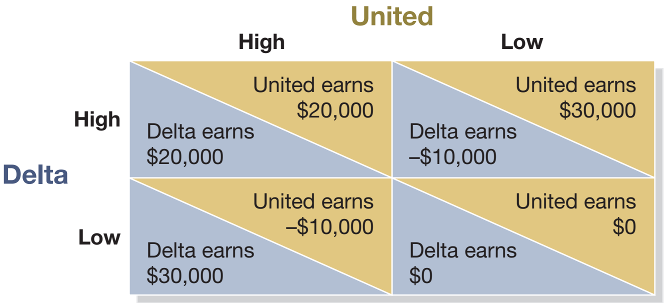
2.13 For products sold on Walmart.com, Walmart agrees to match the prices offered by most large online sites, including Amazon.com, Bestbuy.com, Staples.com, Lowes.com, and Target.com. Walmart doesn't agree to match the prices offered by local retail stores, nor does it match prices offered by competitors for prices of goods it sells in its brick-and-mortar retail stores. Why might Walmart be willing to match the prices charged by online competitors but not the prices charged by local retailers? Why would Walmart be unwilling to match the prices it charges in its brick-and-mortar stores against either online sites or local retailers?

2.14 [Related to the **Apply the Concept "Price Leadership in the Beer Market"**] In 2015, the U.S. Department of Justice (DOJ) investigated whether the four major U.S. airlines were colluding. In 2017, the DOJ concluded that there wasn't enough evidence of collusion to sue the airlines. An article in the *Wall Street Journal* noted, "Justice Department investigators still harbor concerns about what they view as cozy relationships in the industry, but haven't found conduct that clearly crossed the line into an antitrust violation that the department should address." Some analysts believed the airlines were restraining increases in capacity by failing to buy more planes or fly additional routes in order to reduce pressure to cut ticket prices. An airline industry analyst made this comment about the investigation: "I don't sense that the executives talk to each other. They actually hate each other, truth be told. But with so few of them left, there's almost a natural oligopoly."

a. What does the analyst mean by "a natural oligopoly"?

b. Would it be necessary for the airline executives to talk to each other to collude? Briefly explain.

2.15 [Related to the **Apply the Concept "Price Leadership in the Beer Market"**] Airlines sometimes engage in price wars. Consider the following game: Delta and United are the only two airlines flying the route from Houston, Texas, to Omaha, Nebraska. Each firm has two strategies, as illustrated in the following payoff matrix: Charge a high price or charge a low price. (The earnings are per each flight on this route.)



		United	
		High	Low
Delta	High	United earns $20,000 Delta earns $20,000	United earns $30,000 Delta earns –$10,000
	Low	United earns –$10,000 Delta earns $30,000	United earns $0 Delta earns $0

a. What (if any) is the dominant strategy for each firm?

b. Is this game a prisoner's dilemma? Briefly explain.

c. How could repeated playing of the game change the strategy each firm uses?

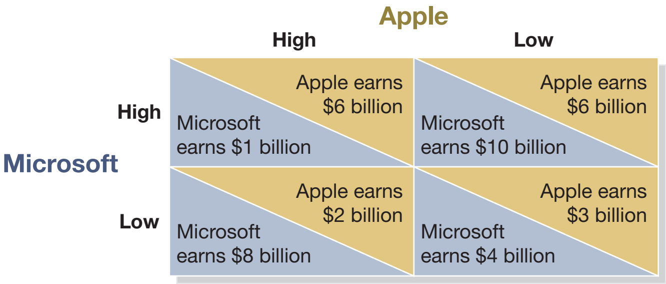
2.16 [Related to the **Apply the Concept "Price Leadership in the Beer Market"**] An article published on reuters.com in early 2021 stated that "restaurants, supermarkets, food distributors, and consumers accused chicken producers of having conspired since 2008 to inflate chicken prices, through tactics such as restricting production." In its lawsuit against several chicken producers filed in late 2020, the U.S. Department of Justice accused the firms of having engaged in bid rigging since at least 2012.

a. Why might firms that were colluding use agreements to restrict production to increase prices rather than just agree to all charge higher prices?

b. What is bid rigging?

c. If chicken producers had been artificially increasing prices by reducing production since 2008 and had been engaged in bid rigging since 2012, why did it take so long for the Department of Justice and chicken buyers to sue the chicken producers?

2.17 Finding dominant strategies is often a very effective way of analyzing a game. Consider the following game: Microsoft and Apple are the two firms in the market for operating systems. Each firm has two strategies, as illustrated in the following payoff matrix: Charge a high price or charge a low price.



		Apple	
		High	Low
Microsoft	High	Apple earns $6 billion Microsoft earns $1 billion	Apple earns $6 billion Microsoft earns $10 billion
	Low	Apple earns $2 billion Microsoft earns $8 billion	Apple earns $3 billion Microsoft earns $4 billion

a. What (if any) is the dominant strategy for each firm?
b. Is there a Nash equilibrium? Briefly explain.

2.18 Suppose there are four large manufacturers of toilet tissue. The largest of these manufacturers announces that it will raise its prices by 15 percent due to higher paper costs. Within three days, the other three large toilet tissue manufacturers announce similar price hikes. Would this decision to raise prices be evidence of explicit collusion among the four companies? Briefly explain.

2.19 An article in the *Wall Street Journal* reported that the governments of the African countries of Ghana and Ivory Coast had formed a cocoa cartel. The cartel intended to increase the price it charged cocoa buyers by $400 per metric ton of the crop. According to the article, “chocolate brands—cocoa producers’ main customers—have few options but to pay up. . . . Ghana and Ivory Coast produce approximately 65% of the world’s cocoa, so no rival market can deliver the massive quantities needed by global chocolate giants.”

a. Describe the difference between a cartel and an oligopoly.
b. If Ghana’s government decreases production to increase the price of cocoa, would the government of Ivory Coast be better off increasing or decreasing its own production of cocoa? Briefly explain.

14.3 Sequential Games and Business Strategies

LEARNING OBJECTIVE: Use sequential games to analyze business strategies.

Summary

Recent work in game theory has focused on actions firms can take to deter the entry of new firms into an industry. Deterring entry can be analyzed using a sequential game, where first one firm makes a decision and then another firm reacts to that decision. Sequential games can be illustrated using decision trees.

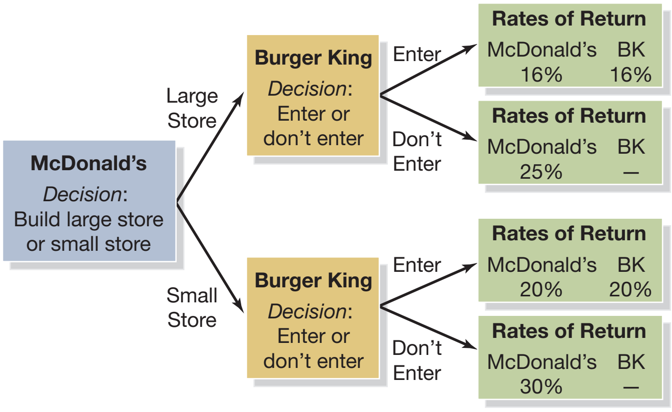
Review Questions

3.1 What is a sequential game?
3.2 How are decision trees used to analyze sequential games?

Problems and Applications

3.3 The most common way that people listen to podcasts is by using Apple’s podcast app. Spotify competes with Apple Music in the market for music streaming. In 2023, Spotify and Apple were first and second in the global market for music streaming. In 2019, Spotify began including podcasts in its streaming subscriptions. An article in the *Wall Street Journal* noted that Spotify had spent heavily on developing its podcasts, including by signing deals with well-known people like Joe Rogan, Michelle Obama, and Kim Kardashian. In 2023, Spotify was suffering losses and laid off 6 percent of its workforce. In terms of its competition with Spotify in streaming music, what advantages did Apple receive as a result of (1) being first to develop a podcast app and (2) not charging users for streaming or downloading podcasts? (Note that some podcasts do charge listeners for at least some of their content.) Were there any downsides to Apple for following this strategy? Briefly explain.

3.4 **[Related to Solved Problem 14.3]** Bradford is a small town that currently has no fast-food restaurants. McDonald’s and Burger King are both considering entering this market. Burger King will wait until McDonald’s has made its decision before deciding whether to enter. McDonald’s will choose between building a large store and building a small store. Once McDonald’s has made its decision about the size of the store it will build, Burger King will decide whether to enter this market. Use the following decision tree to decide the optimal strategy for each company. Does your answer depend on the rate of return that owners of fast-food restaurants must earn on their investments to break even? Briefly explain.



3.5 **[Related to the Economics in Your Life & Career]** In 2020, Sony announced that its PlayStation 5 video game console would have a price of $499. An article observed that the announcement "was not a complete shock. We knew the console would come in at a similar price to the Xbox Series X [by Microsoft]." Microsoft had already announced that the price of the Xbox Series X would be $499. The article also noted that it was costing more than $499 for Sony to produce the PlayStation 5, so the firm would suffer a loss on each console sold. The firm's sales of accessories and games would allow it to still make a profit from the PlayStation 5. Microsoft was able to make a profit on the Xbox Series X console even before taking into account sales of accessories and games.

- **a.** Did Microsoft obtain any advantages in competition with Sony by announcing the price of its new console before Sony announced the price of its new console? Does it matter for your answer whether Microsoft was aware that the cost to Sony of manufacturing the PlayStation 5 would be more than $499? Briefly explain.
- **b.** Another article on the pricing of Sony's and Microsoft's game consoles described the two companies as playing a "game of chicken." What is a game of chicken? In what sense was the interaction between Sony and Microsoft a game of chicken?

3.6 Suppose that in the situation shown in Figure 14.7, TruImage's profit is $1.5 million if the firm accepts Dell's contract offer of $20 per copy. Now will Dell offer TruImage a contract for $20 per copy or a contract for $30 per copy? Briefly explain.

3.7 Refer to Figure 14.5. Consider the entries in the row of the payoff matrix that correspond to Saudi Arabia choosing Low Output. Suppose the numbers change so that Nigeria's profit is $15 million when Nigeria chooses Low Output and $10 million when it chooses High Output.

- **a.** Create the payoff matrix for this new situation, assuming that Saudi Arabia and Nigeria choose their output levels simultaneously. Is there a Nash equilibrium to this game? If so, what is it?
- **b.** Draw the decision tree for this situation, using the values from the payoff matrix you created in part (a), assuming that Saudi Arabia and Nigeria make their decisions sequentially: First, Saudi Arabia chooses its output level, and then Nigeria responds by choosing its output level. Is there a Nash equilibrium in this game? If so, what is it?
- **c.** Compare your answers to parts (a) and (b). Briefly explain the reason for any differences in the outcomes of these two games.

14.4 The Five Competitive Forces Model

LEARNING OBJECTIVE: Use the five competitive forces model to analyze competition in an industry.

Summary

Michael Porter of Harvard Business School argues that the state of competition in an industry is determined by five competitive forces: competition from existing firms, the threat from potential entrants, competition from substitute goods or services, the bargaining power of buyers, and the bargaining power of suppliers.

Review Questions

4.1 Describe the five competitive forces model.

4.2 Does the strength of each of the five competitive forces remain constant over time? Briefly explain.

Problems and Applications

4.3 Briefly explain which of the five competitive forces is involved in each of these business developments.

- **a.** The effect on the Educational Testing Service, which offers the SAT test, as more college admissions offices begin to accept the new Classic Learning Test (CLT)
- **b.** The effect on McDonald's as White Castle and Taco Bell start selling breakfast food
- **c.** The effect on Target retail stores when Harry's razors cuts into Gillette's share of the razor market
- **d.** The effect on the publishing firm Hachette when Amazon bargains to lower the prices of the books Hachette sells on Amazon's site
- **e.** The effect on the AMC movie theater chain of IMAX increasing the fees it charges to theaters to use its technology

4.4 **[Related to the Chapter Opener]** An article in the *Wall Street Journal* quoted Max CEO David Zaslav as saying that producing high-priced movies that would only be streamed on the Max app had done "almost nothing for [Max] in terms of viewership, retention or love of the service." He wanted to begin showing these movies in theaters before streaming them. In addition to any revenue earned from a theatrical release, Zaslav argued that playing in theaters allows movies to generate "word-of-mouth buzz" before they are streamed. Another article in the *Wall Street Journal* noted that theater owners have traditionally "worried that allowing a streaming service into their auditoriums would be supporting a company already accelerating consumers' desire to watch movies at home." Use the five competitive forces model to answer these two questions:

1. Why do streaming services like Max spend heavily on producing movies and series if they don't believe doing so increases the number of subscribers?
2. At the end of 2022, some theaters agreed to show the movie *Glass Onion: A Knives Out Mystery* produced by Netflix. According to an article in the *Wall Street Journal*, on its opening weekend, *Glass Onion* earned "a higher per-screen performance than any other movie in the U.S. and Canada this weekend." What factors do

theater owners need to take into account when deciding whether to show movies produced by streaming services?

4.5 Michael Porter argued that in many industries, "strategies converge and competition becomes a series of races down identical paths that no one can win." Briefly explain whether firms in these industries will likely earn economic profits.

4.6 When Apple first launched Apple Music, singer Taylor Swift refused to allow her album *1989*, which had been the best-selling album of the year, to be made available for the service because Apple did not intend to pay royalties on songs it streamed during an initial 3-month period when the service would be free to subscribers. In response, Apple changed its policy and agreed to pay royalties during those 3 months, even though doing so reduced its profit. Do singers typically have substantial bargaining power with Apple, Spotify, and the other streaming services? Briefly explain.

4.7 **[Related to the Apply the Concept "Do Large Firms Live Forever?"]** An article on cnbc.com about the turnover in the firms included in the S&P 500 stock index notes that "the disruptive force of technology is killing off older companies earlier and at a much faster rate than decades ago, squeezing employees, investors, and other stakeholders."

a. Which of the five competitive forces is new technology likely to represent in a typical industry?

b. The article notes that when firms fail, the firms' employees and investors lose. Can we conclude that the economy would therefore be better off with less technological change? Briefly explain.

4.8 Under Armour, Inc. was founded in 1996 by Kevin Plank, a 23-year-old former University of Maryland football player. The company specializes in manufacturing and selling athletic and casual apparel made from synthetic material that repels moisture. The company does not have patents on the fabric it uses or on its manufacturing process. Use Michael Porter's five competitive forces model to analyze the competition Under Armour faces in the athletic and casual apparel industry.

Critical Thinking Exercises

CT14.1 For this exercise, your instructor may assign you to a group. Each group member should do all of the following.

- **a.** Search sources such as cnn.com, bloomberg.com, the *Wall Street Journal*, or the *New York Times* for one firm that you believe is in a monopolistically competitive industry and another firm that is in an oligopolistic industry.
- **b.** For each firm selected, write down the source of your information and briefly explain why you think the firm is in an industry that is monopolistically competitive or in an industry that is an oligopoly.
- **c.** As a group, select the best example of a monopolistically competitive firm and the best example of an oligopolistic firm. Describe the reason the group decided on its specific examples by identifying several characteristics and behaviors of each firm.

CT14.2 If 3D printing technology vastly reduced economies of scale for the production of cars, how would car companies' pricing strategies change? What kind of market structure might come about after the change?

CT14.3 In this chapter as well as Chapters 11 through 13, you read about firms in several types of market structures. Economists classify industries into four market structures: perfect competition, monopolistic competition, oligopoly, and monopoly. Which feature varies most in these structures: the firms' costs or the demand for the firms' products?

CT14.4 In 2022, Apple introduced Apple Music Classical, an app for classical music. Classical music has been around for centuries, so why would Apple introduce this app in 2022? Hint: Read the blog entry "Streaming Conquers the Music Industry" at https://hubbardobrieneconomics.com/2021/11/04/streaming-conquers-the-music-industry/.

15 Monopoly and Antitrust Policy

The Monopoly in Your Mailbox

Are you an accidental lawbreaker? You may never have thought twice about placing holiday cards or flyers publicizing a yard sale in your neighbors' mailboxes. But technically you were breaking a federal law that prohibits anyone other than an employee of the U.S. Postal Service (USPS) from putting anything in a residential mailbox.

In 1775, during the American Revolution, the Continental Congress appointed Benjamin Franklin the first postmaster general. To provide a system to deliver mail nationwide, in 1792, Congress formally established what was called the General Post Office and made it illegal for anyone to set up a competing system of mail delivery. In 1913, the Post Office began delivering packages as well as letters. Parcel post was a boon to people living outside cities because it allowed them for the first time to buy a wide range of goods from mail-order catalogs offered by firms such as Sears and Montgomery Ward.

During the Great Depression of the 1930s, the volume of letters and packages declined substantially, reducing the Post Office's revenue. In response, in 1934, President Franklin Roosevelt and Congress enacted the Private Express Statutes, which made it illegal for anyone other than a postal employee to put anything in a residential mailbox. By the 1960s, the Post Office was delivering more than 40 trillion letters per year. Although the Post Office introduced the zip code system in 1963 to speed mail delivery, it was slow to adopt optical character recognition technology that automates the sorting of letters and packages. As a result, there were several publicized incidents of mountains of mail accumulating in big city post offices, leading to some letters and packages being delivered weeks late.

In response to these problems, some economists proposed ending the Post Office's monopoly by allowing private firms to deliver letters and packages to residential mailboxes. In 1970, Congress instead passed the Postal Reorganization Act, replacing the Post Office with the U.S. Postal Service, which operates as an independent agency of the federal government. The management of the USPS has the authority to make decisions about many aspects of how the system operates, although the Postal Regulatory Commission, whose members are appointed by the president, must approve any changes in postal rates.

robusa/Alamy Stock Photo

The creation of the internet and smartphones and the increased use of e-mail and text messaging have led to a 45 percent decline in the quantity of letters and other first-class mail since 2000. The USPS has also struggled with competition from FedEx and UPS in the package delivery business. In addition, the USPS has also been criticized in recent years for delayed deliveries. In late 2020, largely as a result of the effects of the Covid–19 pandemic, the USPS experienced packages and letters piling up in post offices and delays of up to several weeks in delivering some holiday packages. In 2022, to cut costs, the USPS began using more trains and trucks than airplanes when shipping packages over long distances. As a result, many first-class packages arrived one or two days later than previously. In 2023, many rural communities experienced long delays in mail delivery. An article in the *Wall Street Journal* quoted Vermont Senator Peter Welch as saying: "We are at our wits' end trying to get the Postal Service to do its job. Most of us are realizing it's not just Vermont, it's not just Colorado, it's all across rural America."

In response to the problems, some economists and policymakers have again advocated eliminating the USPS's monopoly over deliveries to residential mailboxes.

Monopolies are rare, but they are worth studying because they provide a benchmark for how firms behave when they face little or no competition. In this chapter, we build a model to analyze monopolies and discuss government policies toward monopoly. We also discuss how firms use a strategy called *price discrimination* to increase their profits.

Chapter Outline & Learning Objectives

15.1 Is Any Firm Ever Really a Monopoly? page 516
Define monopoly.

15.2 Where Do Monopolies Come From? page 518
Explain the four main reasons monopolies arise.

15.3 How Does a Monopoly Choose Price and Output? page 522
Explain how a monopoly chooses price and output.

15.4 Does Monopoly Reduce Economic Efficiency? page 528
Use a graph to illustrate how a monopoly affects economic efficiency.

15.5 Price Discrimination: Charging Different Prices for the Same Product, page 531
Explain how a firm can increase its profits through price discrimination.

15.6 Government Policy toward Monopoly, page 539
Explain how the government regulates monopoly.

Economics in Your Life & Career

Can a Business Run from Your Dorm Be a Monopoly?

You and your roommate Fatma hear students complaining about the lack of food services on campus on Saturday and Sunday evenings, so you come up with an idea for a business: You will buy rolls, lunch meat, lettuce, and tomatoes and become the sole seller of submarine sandwiches in your school's dormitories on those evenings. You believe that there will be many hungry customers when students return to their dorms from the library and off-campus events. What price will you charge for the subs?

Fatma argues that because your business is a monopoly, you can charge prices much higher than what local shops charge for subs during the day; hungry students will have to buy your subs or stay hungry until the following day. You want to make a profit from your business but are not sure whether Fatma is right. Is your business a monopoly? Should you charge high prices for your subs? As you read this chapter, try to answer these questions. You can check your answers against those we provide at the end of this chapter.

Although few firms are monopolies, the economic model of monopoly can be quite useful. As we discussed in Chapter 12, even though perfectly competitive markets are rare, the competitive market model provides a benchmark for how a firm acts when it is in an industry, such as farming, with many firms that all supply the same product. Monopoly provides a benchmark for the other extreme, where a firm is the only one in its industry and, therefore, faces no competition from other firms. The monopoly model is also useful in analyzing situations in which firms agree to *collude*, or not compete, and act together as if they were a monopoly. As we will discuss in this chapter, collusion is illegal in the United States, but it occasionally happens.

Monopolies pose a dilemma for the government. Should the government allow monopolies to exist? Are there circumstances in which the government should actually promote the existence of monopolies? Should the government regulate the prices monopolies charge? In this chapter, we will explore these public policy issues.

15.1 Is Any Firm Ever Really a Monopoly?

LEARNING OBJECTIVE: Define monopoly.

Monopoly A firm that is the only seller of a good or service for which there is not a close substitute.

A **monopoly** is a firm that is the only seller of a good or service for which there is not a close substitute. Substitutes of some kind exist for just about every product, so are there actually any monopolies? The answer is "yes," provided that the substitutes are not "close" substitutes. But how do we decide whether a substitute is a close substitute? A narrow definition of monopoly that some economists use is that a firm has a monopoly if it can ignore the actions of all other firms. In other words, if a firm can ignore the prices other firms charge, it has a monopoly because other firms must not be producing close substitutes. For example, candles are a substitute for electric lights, but your local electric company can ignore candle prices because even if the price of candles drops significantly, almost no customers will give up using electric lights and switch to candles. Therefore, your local electric company is clearly a monopoly.

Many economists, however, use a broader definition of *monopoly*. For example, consider the only seafood restaurant in a small town. Does this restaurant have a monopoly? Substitutes for seafood dinners certainly exist. If the price of seafood dinners rises too high, many people will switch to eating at a restaurant that serves steak or some other food. So, the only seafood restaurant in a small town does not meet the narrow definition of a monopoly. Many economists, however, would still label the restaurant a monopoly.

We have seen that when firms earn an economic profit, we can expect new firms to enter the industry, and in the long run, the economic profit is competed away (see Chapter 12, Section 12.5). The profit earned by the only seafood restaurant in a small town will not be competed away as long as it is the *only* seller of seafood dinners. If no other seafood restaurants open in the town, the restaurant can be considered a monopoly because there are no other firms selling a substitute close enough that its economic profit will be competed away.

Apply the Concept

Has the USPS Outlived Its Usefulness?

The U.S. Postal Service (USPS) is often described as a monopoly—but is it? To decide, let's consider the four main types of mail it delivers:

1. First-class mail, which is mainly personal letters, bills sent by businesses, and small packages
2. Periodicals, such as newspapers and magazines
3. Marketing mail, such as advertising circulars and printed catalogs
4. Packages

1 800 PICK UPS
www.ups.com

Eldad Carin/Alamy Stock Photo

Does the existence of competitors such as UPS and FedEx mean we don't need the U.S. Postal Service?

The USPS clearly does not have a monopoly in the delivery of packages because it faces strong competition from other package delivery services, particularly FedEx and UPS. Amazon has expanded delivery of its own packages and also offers delivery services to other firms. Postmaster General Louis DeJoy has proposed emphasizing package delivery over first-class mail delivery because the volume of package deliveries is expanding, while the volume of first-class mail continues to decline. The USPS does have an advantage in that its competitors cannot legally leave small packages in residential mailboxes, but this advantage seems unlikely to protect the USPS from having its share of the package delivery market gradually decline.

The USPS does have a legal monopoly on delivering the other three types of mail to residential mailboxes. This advantage seems to be important because the marginal revenue the USPS receives from providing these services consistently exceeds the marginal cost. For example, during 2021, marginal revenue from delivering these types of mail was about $14 billion greater than marginal cost. (Taking all of its services together, in 2021 the USPS suffered a loss on its operations of $2.7 billion.) The USPS does face some indirect competition even with these mail services. Newspapers are often delivered directly to homes rather than being mailed. In addition, newspapers and magazines are also increasingly moving online. The content of advertising circulars and catalogs is also available online and is sometimes included in newspapers delivered to homes. Personal letters are rapidly being replaced by e-mails, texts, and social media posts. Bills and invoices are increasingly being sent and paid electronically.

Given the changes in the economy and in technology, is it good public policy for Congress to allow the USPS to continue its monopoly of residential mailboxes? In 2018, a Trump administration task force suggested changing the law to allow the USPS to charge other firms for access to residential mailboxes. Some economists and policymakers advocate going further by eliminating the USPS and relying entirely on private firms for mail delivery.

The traditional argument in favor of having the government operate a post office is that there are positive externalities from the delivery of mail. (For a discussion of externalities in production, see Chapter 5, Section 5.1.) The framers of the U.S. Constitution considered having a government-operated post office important enough to include in Article I, Section 8, which authorizes Congress "to establish Post Offices and Postal Roads." They believed that all citizens, including those living in remote areas, would be better informed and engaged in public policy if they received newspapers and other mail. In current law, Congress requires that the USPS:

> . . . provide postal services to bind the Nation together through the personal, educational, literary, and business correspondence of the people. It shall provide prompt, reliable, and efficient services to patrons in all areas and shall render postal services to all communities.

Because of this *universal service obligation*, the USPS provides some services it otherwise wouldn't and provides some services at lower rates than it would charge if it were allowed to charge higher rates. These services include (1) operating post offices in thinly populated rural areas, (2) delivering mail by air to remote areas of Alaska, (3) charging reduced rates for mailing newspapers and magazines, (4) delivering mail six days per week, and (5) charging the same rate for all letters, despite differences in the costs of delivery. Private firms would be unlikely to continue these policies if the USPS were abolished. Some policymakers and economists have suggested allowing the USPS to close many smaller, less-efficient post offices and reduce the frequency of mail deliveries, perhaps by eliminating Saturday deliveries. Postmaster General DeJoy has proposed allowing the USPS to take five days to deliver first-class mail rather than three. But, as we noted in the chapter opener, in 2023, members of Congress representing rural areas and small towns were dissatisfied with long delays in delivering mail in their districts and were pushing the USPS to increase the frequency of deliveries in these areas.

Abolishing the USPS would increase competition for some postal services and therefore lower their prices, but it would also eliminate regular mail delivery to some rural areas, raise the cost of mailing newspapers and magazines, and possibly end regular mail delivery on Saturdays. Policymakers continue to debate the trade-offs involved with the current system of mail service in the United States.

Your Turn: Test your understanding by doing related problem 1.6 at the end of this chapter.

15.2 Where Do Monopolies Come From?

LEARNING OBJECTIVE: Explain the four main reasons monopolies arise.

Because monopolies do not face competition, every firm would like to have a monopoly. But to have a monopoly, barriers to entering the market must be so high that no other firms can enter. *Barriers to entry* may be high enough to keep out competing firms for four main reasons:

1. Government action blocks the entry of more than one firm into a market.
2. One firm has control of a key resource necessary to produce a good.
3. There are important *network externalities* in supplying the good or service.
4. Economies of scale are so large that one firm has a *natural monopoly*.

Government Action Blocks Entry

As we will discuss in Section 15.6, governments ordinarily try to promote competition in markets, but sometimes governments take action to block entry into a market. In the United States, governments block entry in two main ways:

1. By granting a *patent*, *copyright*, or *trademark* to an individual or a firm, giving it the exclusive right to produce a product
2. By granting a firm a *public franchise*, making it the exclusive legal provider of a good or service

Patent The exclusive legal right to produce a product for a period of 20 years from the date the patent application is filed with the government.

Patents, Copyrights, and Trademarks The U.S. government grants patents to firms that develop new products or new ways of making existing products. A **patent** gives a firm the exclusive legal right to a new product for a period of 20 years from the date the patent application is filed with the government. Because Apple has a patent on the iOS operating system for smartphones, other firms can't sell their versions of iOS. The government grants patents to encourage firms to spend money on the research and development necessary to create new products. If other firms could freely copy iOS, Apple would probably not have spent the time and money necessary to develop it. Sometimes a firm is able to maintain a monopoly in the production of a good without patent protection, provided that it can keep secret how the product is made.

Patent protection is critical to pharmaceutical firms because they start research and development work on a new prescription drug an average of 12 years before the drug is available for sale. A firm applies for a patent about 10 years before it begins to sell the product. The average 10-year delay between the government granting a patent and the firm actually selling the drug is due to the federal Food and Drug Administration's requirements that the firm demonstrate that the drug is both safe and effective. (In 2020 and 2021, U.S. pharmaceutical firms were able to develop effective vaccines against Covid–19 in less than a year, and the Food and Drug Administration expedited approval of the vaccines on an emergency use basis.) Therefore, during the period before the drug can be sold, the firm will have significant costs to develop and test it. If the drug does not successfully make it to market, the firm will have a substantial loss.

Once a drug is available for sale, the profit the firm earns from the drug will increase throughout the period of patent protection—which is usually about 10 years—as the drug becomes more widely known to doctors and patients. After the patent has expired, other firms are free to legally produce chemically identical drugs called *generic drugs*. Gradually, competition from generic drugs will eliminate the profit the original firm had been earning. For example, when patent protection expired for Glucophage, a diabetes drug manufactured by Bristol Myers Squibb, revenue from the drug declined by more than $1.5 billion in the first year due to competition from 12 generic versions of the drug produced by other firms. When the patent expired on Prozac, an antidepressant drug manufactured by Eli Lilly, revenue dropped by more than 80 percent. Most economic profit from selling a prescription drug is eliminated 20 years after the drug is first offered for sale.

A *trademark* grants a firm legal protection against other firms using its product's name. Trademarks are also called *brand names*. The U.S. Patent and Trademark Office defines a trademark as "any word, name, symbol, device, or any combination, used or intended to be used to identify and distinguish the goods/services of one seller or provider from those of others, and to indicate the source of the goods/services." Firms often vigorously defend their trademarks, including by filing lawsuits against other firms for selling goods that infringe on their trademarks. For example, Christian Louboutin filed a lawsuit against Yves Saint Laurent, claiming that Yves Saint Laurent had infringed on Christian Louboutin's trademark on women's shoes with red soles. A court ruled that Yves Saint Laurent could use red on soles only when that color contrasted with the color of the upper part of the shoe.

Apply the Concept

Does Hasbro Have a Monopoly on Monopoly?

To receive a copyright, patent, or trademark, a work has to be substantially new. Once a work no longer has legal protection, it is in the *public domain* and available to be freely used. It wouldn't be possible, for example, to make small changes to Mark Twain's novel *Huckleberry Finn* and then claim copyright on the book because it has been in the public domain for decades. (If you drew new illustrations for the book, however, it would be possible to copyright those illustrations independently of the text of the book.)

CaseyMartin/Shutterstock

Hasbro's trademark on its Monopoly game prevents other companies from creating and selling similar games using the same name.

Hasbro is the multinational U.S. company that owns Monopoly, one of the world's most popular board games. The company estimates that more than 275 million copies of the game have been sold, and it is available in 43 languages. According to Hasbro, Charles Darrow invented the game in the 1930s. After selling many homemade copies, Darrow sold the game to Parker Brothers. In 1935, the U.S. Patent and Trademark Office issued Parker Brothers a trademark on the use of the name Monopoly for a board game. Hasbro bought Parker Brothers in 1991. Trademarks, unlike patents and copyrights, never expire, so Hasbro continues to have a trademark on the name Monopoly.

The late Ralph Anspach, who was an economics professor at California State University, San Francisco, received an unexpected lesson in the law of trademarks when he decided in the 1970s to sell a game about competition that he titled Anti-Monopoly. The game was a hit, selling 200,000 copies the first year. Parker Brothers sued Anspach on the grounds that his game infringed on its Monopoly trademark. In the course of defending the lawsuit, Anspach believed he had uncovered evidence that in 1904, Elizabeth Magie had developed The Landlord's Game—which was very similar to Monopoly. Magie did not trademark the game, which was played for years on the East Coast. According to Anspach, Darrow became aware of The Landlord's Game in the mid-1930s, made a few changes to it, and sold it to Parker Brothers in 1935. A federal appeals court largely agreed with Anspach that, given the history of the game, the name Monopoly was in the public domain and so couldn't be trademarked. Congress later amended the law, though, in a way that reinstated the Parker Brothers trademark. Eventually, Anspach and Hasbro worked out a settlement under which Anspach was allowed to sell his Anti-Monopoly game under a license from Hasbro.

Losing the trademark on its Monopoly game would have cost Hasbro millions of dollars per year because other companies could have begun to market similar games using the same name. The long legal fight the company had with Professor Anspach illustrates that companies consider it critical to retain exclusive control of their products.

Your Turn: Test your understanding by doing related problem 2.9 at the end of this chapter.

Copyright A government-granted exclusive right to produce and sell a creation for up to 70 years after the creator's death.

Just as the federal government grants a new product patent or trademark protection, it grants creators of books, films, and pieces of music **copyright** protection, which is the exclusive right to use a creation during the creator's lifetime. The creator's heirs retain this exclusive right for 70 years after the creator's death. In effect, copyrights create monopolies for the copyrighted items. Without copyrights, individuals and firms would be less likely to invest in creating new books, films, and software. When the period of copyright protection ends, a work enters the *public domain*, which means anyone can freely use the work. For instance, as popular mystery writer Agatha Christie's books have entered the public domain, they have been reprinted by several publishers.

Public franchise A government designation that a firm is the only legal provider of a good or service.

Public Franchises In some cases, the government grants a firm a **public franchise** that allows it to be the only legal provider of a good or service. For example, state and local governments often designate one company as the sole provider of electricity, natural gas, or water.

Occasionally, a government may decide to provide certain services directly to consumers through a *public enterprise*. Public enterprises are more common in Europe than in the United States. For example, the governments in many European countries own the freight railroads. In the United States, many city governments provide water and sewage service rather than rely on private firms. As we've seen, Congress has given the U.S. Postal Service the exclusive right to deliver first-class letters and packages to residential mailboxes.

Control of a Key Resource

Another way for a firm to become a monopoly is by controlling a key resource. Firms rarely gain this control because most resources, including raw materials such as oil or iron ore, are widely available from a variety of suppliers. There are, however, a few prominent examples of monopolies based on control of a key resource, such as the Aluminum Company of America (Alcoa) and the International Nickel Company of Canada.

For many years, until the 1940s, Alcoa either owned or had long-term contracts to buy nearly all of the available bauxite, the mineral needed to produce aluminum. Without access to bauxite, competing firms had to use recycled aluminum, which limited the amount of aluminum they could produce. Similarly, the International Nickel Company of Canada controlled more than 90 percent of available nickel supplies. Competition in the nickel market increased when the Petsamo nickel fields in northern Russia were developed after World War II.

In the United States, a key resource for a professional sports team is a large stadium. The teams that make up the major professional sports leagues—Major League Baseball, the National Football League, the National Hockey League, and the National Basketball Association—usually either own or have long-term leases with the stadiums in major cities. Control of these stadiums is a major barrier to new professional baseball, football, hockey, or basketball leagues forming.

Network Externalities

Network externality A situation in which the usefulness of a product increases with the number of consumers who use it.

There is a **network externality** in the consumption of a product if its usefulness increases with the number of people who use it. If you owned the only smartphone in the world, for example, it would not be very valuable because firms would not have an incentive to develop apps for your smartphone. The more smartphones there are in use, the more valuable they become to consumers.

Some economists argue that network externalities can serve as barriers to entry. For example, in the early 1980s, Microsoft gained an advantage over other software companies by developing MS-DOS, the operating system for the first IBM personal computers. Because IBM sold more computers than any other company, software developers wrote many application programs for MS-DOS. The more people who used MS-DOS–based programs, the greater the value to a consumer of using a computer with the MS-DOS operating system. By the 1990s, Microsoft had replaced MS-DOS with Windows. In 2023, Windows had a 70 percent share in the global market for personal computer operating systems, Apple's operating system had a 15 percent share, and other operating systems, including the open-source Linux system, had shares of 3 percent or less. If another firm introduced a new operating system, some economists argue that relatively few people would use it initially, and few applications would run on it, which would limit the operating system's value to other consumers.

eBay was the first internet site to attract a significant number of people to its online auctions. Once many people began to use eBay to buy and sell collectibles, antiques, and many other products, it became a more valuable place to buy and sell. Other internet sites, such as Yahoo.com and Amazon.com, eventually started online auctions, but they had difficulty attracting buyers and sellers. On eBay, a buyer expects to find more sellers, and a seller expects to find more potential buyers than on other auction sites.

As these examples show, from a firm's point of view, network externalities can set off a *virtuous cycle*: If a firm can attract enough customers initially, it can attract additional customers because the value of its product has been increased by more people using it, which attracts even more customers, and so on. With products such as computer operating systems and online auctions, it might be difficult for new firms to enter the market and compete away the profit being earned by the first firm in the market.

Economists debate the extent to which network externalities are important barriers to entry in the business world. Some economists argue that Microsoft and eBay have dominant positions primarily because they are efficient in offering products that satisfy consumer preferences rather than because of the effects of network externalities. In this view, the advantages firms gain from network externalities would not be enough to protect them from competing firms offering better products. For example, many people have switched from computers to tablets and smartphones that run on Apple's iOS or Google's Android operating system, making Microsoft's domination of computer operating systems less important.

Natural Monopoly

Economies of scale exist when a firm's long-run average cost falls as it increases the quantity of output it produces (see Chapter 11, Section 11.6). A **natural monopoly** occurs when economies of scale are so large that one firm can supply the entire market at a lower average total cost than can two or more firms. In that case, there is "room" in the market for only one firm.

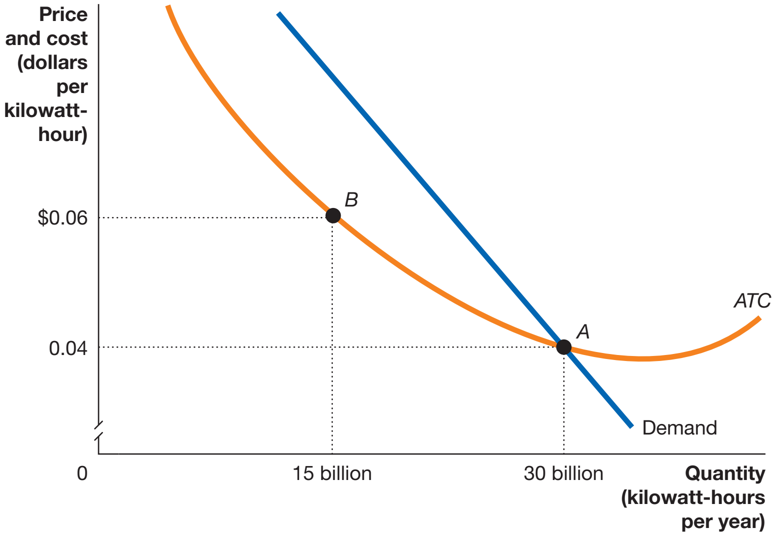
Natural monopoly A situation in which economies of scale are so large that one firm can supply the entire market at a lower average total cost than can two or more firms.

Figure 15.1 shows the average total cost curve for a firm producing electricity and the total demand for electricity in the firm's market. Notice that the average total cost curve is still falling when it crosses the demand curve at point *A*. If the firm is a monopoly and produces 30 billion kilowatt-hours of electricity per year, its average total cost of production will be \$0.04 per kilowatt-hour. Suppose instead that two firms are in the market, each producing half the market output, or 15 billion kilowatt-hours per year. Assume that each firm has the same average total cost curve. The figure shows that producing 15 billion kilowatt-hours will move each firm back up its average cost curve so that the average cost of producing electricity will rise to \$0.06 per kilowatt-hour (point *B*). In this case, if one of the firms expands production, it will move down the average total cost curve. With lower average costs, it will be able to offer electricity at a lower price than the other firm can offer. Eventually, the other firm will be driven out of business, and the remaining firm will have a monopoly. Because a monopoly would develop automatically—or *naturally*—in this market, it would be a natural monopoly.

Figure 15.1

Average Total Cost Curve for a Natural Monopoly

With a natural monopoly, the average total cost curve is still falling when it crosses the demand curve (point *A*). If only one firm is producing electric power in the market, and it produces where the average cost curve intersects the demand curve, average total cost will equal $0.04 per kilowatt-hour of electricity produced. If the market is divided between two firms, each producing 15 billion kilowatt-hours, the average cost of producing electricity rises to $0.06 per kilowatt-hour (point *B*). In this case, if one firm expands production, it can move down the average total cost curve, lower its price, and drive the other firm out of business.



Natural monopolies are most likely to occur in markets where fixed costs are very large relative to variable costs. For example, a firm that produces electricity must make a substantial investment in the machinery and equipment necessary to generate electricity and in the wires and cables necessary to distribute it. Once the firm makes the initial investment, however, the marginal cost of producing another kilowatt-hour of electricity is relatively small.

15.3 How Does a Monopoly Choose Price and Output?

LEARNING OBJECTIVE: Explain how a monopoly chooses price and output.

Like every other firm, a monopoly maximizes profit by producing where marginal revenue equals marginal cost. A monopoly differs from other firms in that *a monopoly's demand curve is the same as the market demand curve for the product*. With perfect competition, the market demand curve for wheat is very different from the demand curve for the wheat produced by any one farmer (see Chapter 12, Section 12.1). If, however, one farmer had a monopoly on wheat production, the two demand curves would be exactly the same.

Marginal Revenue Once Again

Recall that firms in perfectly competitive markets—such as a farmer in the wheat market—face horizontal demand curves. These firms are *price takers*. All other firms, including monopolies, are *price makers*. If price makers raise their prices, they will lose some, but not all, of their customers. Therefore, they face both a downward-sloping demand curve and a downward-sloping marginal revenue curve. Let's review why a firm's marginal revenue curve slopes downward if its demand curve slopes downward.

Remember that when a firm cuts the price of a product, one good thing happens, and one bad thing happens:

- **The good thing:** The firm sells more units of the product.
- **The bad thing:** The firm receives less revenue from each unit than it would have received at the higher price.

For example, consider the table in Figure 15.2, which shows hypothetical data on the market for first-class mail. If you want to have a letter or a bill delivered to a residential mailbox, you have no choice but to buy a first-class stamp (known as a Forever Stamp) from the USPS. Even though the volume of first-class mail has been declining, in 2022, the USPS delivered about 49 billion pieces of first-class mail. But to make our example

Stamps per Day (*Q*)	Price (*P*)	Total Revenue (*TR* = *P* x *Q*)	Average Revenue (*AR* = *TR*/*Q*)	Marginal Revenue (*MR* = Δ*TR*/Δ*Q*)
0	$0.85	$0	–	–
1	0.80	0.80	$0.80	$0.80
2	0.75	1.50	0.75	0.70
3	0.70	2.10	0.70	0.60
4	0.65	2.60	0.65	0.50
5	0.60	3.00	0.60	0.40
6	0.55	3.30	0.55	0.30
7	0.50	3.50	0.50	0.20
8	0.45	3.60	0.45	0.10
9	0.40	3.60	0.40	0.00
10	0.35	3.50	0.35	–0.10

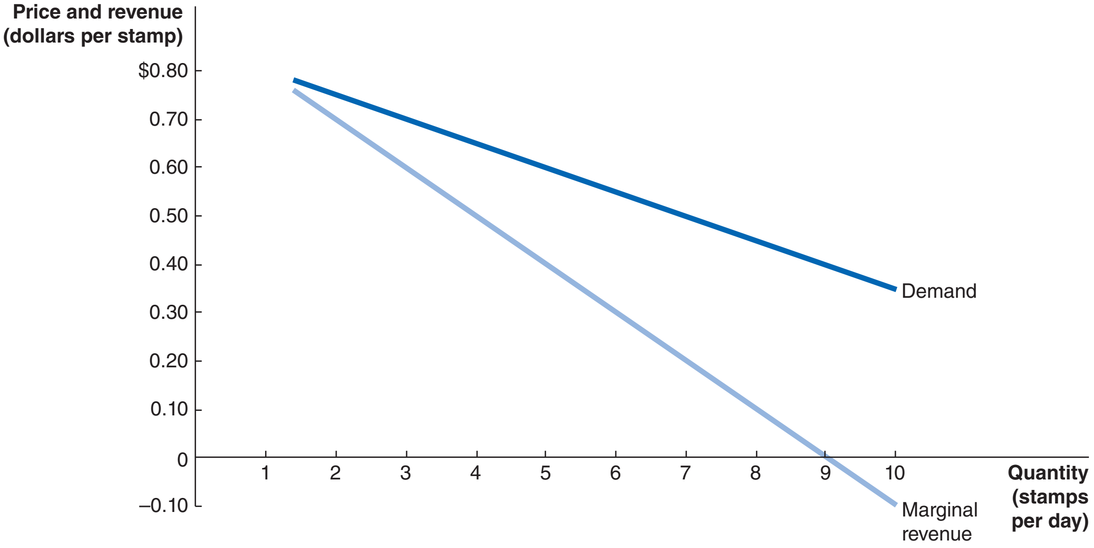


Figure 15.2 **Calculating a Monopoly's Revenue**

The USPS faces a downward-sloping demand curve for first-class stamps. To sell more stamps, it must cut the price. By cutting the price, the USPS gains revenue from selling more stamps but loses revenue from selling at a lower price the stamps that it could have sold at a higher price. The USPS's marginal revenue is the change in revenue from selling another stamp. We can calculate marginal revenue by subtracting the revenue lost as a result of a price cut from the revenue gained. The table shows that the USPS's marginal revenue is less than the price for every stamp sold after the first stamp. Therefore, the USPS's marginal revenue curve will be below its demand curve.

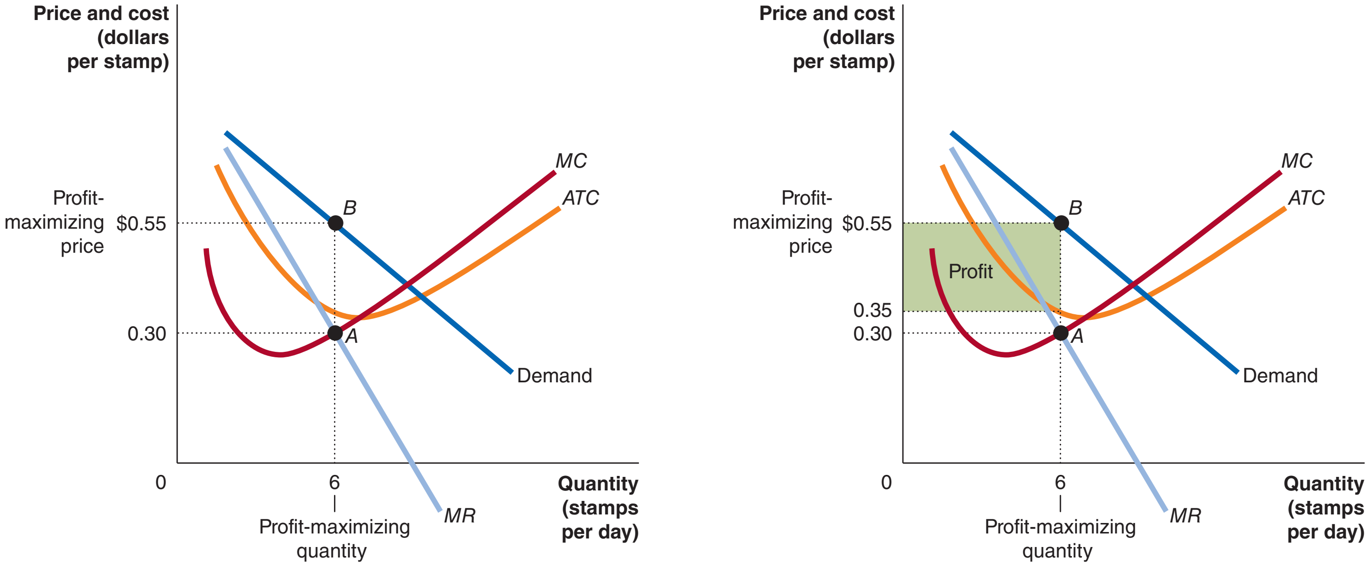
simple enough to follow, we'll assume that there are only 10 potential customers for stamps. (Alternatively, we could make the units hundreds of millions of stamps sold per day, but that would complicate the arithmetic.) If the USPS charges $0.85 for a stamp to mail a letter, it doesn't sell any stamps. If it charges a price of $0.80, it sells 1 stamp. At $0.75, it sells 2 stamps, and so on. The USPS's total revenue is equal to the quantity of stamps sold per day multiplied by the price. Its average revenue—or revenue per stamp sold—is equal to its total revenue divided by the quantity of stamps sold. The USPS is interested in marginal revenue because it indicates how much the USPS's revenue will increase if it cuts the price to sell 1 more stamp.

Notice that the USPS's marginal revenue is less than the price for every stamp sold after the first stamp. To see why, think about what happens if the USPS cuts the price of a stamp from $0.55 to $0.50, which increases its quantity of stamps sold from 6 to 7. The USPS increases its revenue by the $0.50 it receives for the seventh stamp, but it also loses revenue of $0.05 per stamp on the first 6 stamps because it could have sold them at the old price of $0.55. So, its marginal revenue on the seventh stamp is $0.50 − $0.30 = $0.20, which is the value shown in the table. The graph in Figure 15.2 plots the USPS's demand and marginal revenue curves, based on the information in the table.

Profit Maximization for a Monopolist

Figure 15.3 shows how the USPS combines the information on demand and marginal revenue with information on average and marginal costs to decide how many stamps to sell and what price to charge. (Congress requires the management of the USPS to get approval from the Postal Rate Commission for any changes in the price of stamps. The USPS also has other goals, such as providing mail services to remote rural areas, beyond maximizing its profit on first-class stamps. For simplicity, we ignore these complications.) We assume that the USPS has marginal cost and average total cost curves with the typical U shapes we have encountered in previous chapters. In panel (a), we see how the USPS can calculate its profit-maximizing quantity and price. As long as the marginal cost of selling one more stamp is less than the marginal revenue, the USPS should sell additional stamps because it is adding to its profit. As it sells more stamps, rising marginal cost will eventually equal marginal revenue, and it will be selling the profit-maximizing quantity of stamps. The USPS maximizes profit with the sixth stamp, which adds $0.30 to its costs and $0.30 to its revenues—point *A* in panel (a) of Figure 15.3. The demand curve indicates that the USPS can sell 6 stamps for a price of $0.55. We can conclude that the USPS's profit-maximizing quantity of stamps is 6, and its profit-maximizing price is $0.55.

Panel (b) shows that the USPS's average total cost of producing 6 stamps is $0.35 and that the USPS can sell 6 stamps at a price of $0.55 (point *B* on the demand curve). The USPS is making a profit of $0.20 per stamp: the price of $0.55 minus the average cost of $0.35. Its total profit is $1.20 (= 6 stamps × $0.20 profit per stamp), which is shown by the area of the green-shaded rectangle in the figure. We could also have calculated total profit as the difference between total revenue and total cost. The USPS's total revenue from selling 6 stamps is $3.30. Its total cost equals its average total cost multiplied by the number of stamps sold, or $0.35 × 6 = $2.10. So, the USPS's profit is $3.30 − $2.10 = $1.20.



(a) Profit-maximizing quantity and price for a monopolist

(b) Profit for a monopolist

Figure 15.3 **Profit-Maximizing Price and Output for a Monopoly**

Panel (a) shows that to maximize profit, the USPS should sell stamps up to the point where the marginal revenue from selling the last stamp equals its marginal cost (point *A*). In this case, both the marginal revenue from selling the sixth stamp and the marginal cost are $0.30. The USPS maximizes profit by selling 6 stamps per day and charging a price of $0.55 (point *B*).

In panel (b), the green rectangle represents the USPS's profit. The rectangle has a height equal to $0.20, which is the $0.55 price minus the $0.35 average total cost, and a base equal to the quantity of 6 stamps. The USPS's profit therefore equals $0.20 × 6 = $1.20.

Note that even though the USPS is earning an economic profit, new firms will *not* enter the market unless Congress changes the law to allow the firms access to residential mailboxes. Under current law, the USPS has a monopoly and will not face competition from other firms. Therefore, if the demand for stamps and its costs remain unchanged, the USPS will be able to continue to earn an economic profit on first-class mail, even in the long run.

Solved Problem 15.3

Finding the Profit-Maximizing Price and Output for a Cable Monopoly

Suppose that Comcast has a cable monopoly in Philadelphia. The following table gives Comcast's demand and cost per month for subscriptions to basic cable. (For simplicity, we keep the number of subscribers artificially small.)

Price	Quantity	Total Revenue	Marginal Revenue $\left(MR = \frac{\Delta TR}{\Delta Q}\right)$	Total Cost	Marginal Cost $\left(MC = \frac{\Delta TC}{\Delta Q}\right)$
$27	3			$56	
26	4			73	
25	5			91	
24	6			110	
23	7			130	
22	8			151	

a. Fill in the missing values in the table.

b. If Comcast wants to maximize profit, what price should it charge, and how many cable subscriptions per month should it sell? How much profit will Comcast make? Briefly explain.

c. Suppose the city government imposes a $25-per-month tax on Comcast. Now what price should Comcast charge, how many subscriptions should it sell, and what will its profit be?

Solving the Problem

Step 1: Review the chapter material. This problem is about finding the profit-maximizing quantity and price for a monopolist, so you may want to review the section "Profit Maximization for a Monopolist."

Step 2: Answer part (a) by filling in the missing values in the table. Remember that to calculate marginal revenue and marginal cost, you divide the change in total revenue or total cost by the change in quantity.

We don't have enough information from the table to fill in the values for marginal revenue and marginal cost in the first row.

Price	Quantity	Total Revenue	Marginal Revenue $\left(MR = \frac{\Delta TR}{\Delta Q}\right)$	Total Cost	Marginal Cost $\left(MC = \frac{\Delta TC}{\Delta Q}\right)$
$27	3	$81	—	$56	—
26	4	104	$23	73	$17
25	5	125	21	91	18
24	6	144	19	110	19
23	7	161	17	130	20
22	8	176	15	151	21

Step 3: **Answer part (b) by determining the profit-maximizing quantity and price.** We know that Comcast will maximize profit by selling subscriptions up to the point where marginal cost equals marginal revenue. In this case, that means selling 6 subscriptions per month. From the information in the first two columns, we know Comcast can sell 6 subscriptions at a price of $24 each. Comcast's profit is equal to the difference between its total revenue and its total cost: Profit = $144 − $110 = $34 per month.

Step 4: **Answer part (c) by analyzing the effect of the tax.** The tax is a fixed cost to Comcast because it is a flat $25, no matter how many subscriptions it sells. Because the tax doesn't affect Comcast's marginal revenue or marginal cost, the profit-maximizing level of output has not changed. So, Comcast will still sell 6 subscriptions per month at a price of $24, but its profit will fall by the amount of the tax, from $34 per month to $9 per month.

Your Turn: For more practice, do related problems 3.4 and 3.5 at the end of this chapter.

Don't Let This Happen to You

Don't Assume That Charging a Higher Price Is Always More Profitable for a Monopolist

When reading the solution to Solved Problem 15.3, Step 4, you might be tempted to argue that Comcast should increase its price to make up for the tax. After all, Comcast is a monopolist, so why can't it just pass along the tax to its customers? The reason it can't is that Comcast, like any other monopolist, must pay attention to demand. Comcast is not interested in charging high prices for the sake of charging high prices; it is interested in maximizing profit. Charging a price of $1,000 per month for a basic cable subscription sounds good, but if no one will buy at that price, Comcast would not be maximizing profit.

To look at it another way, before the tax is imposed, Comcast has already determined that $24 per month is the price that will maximize its profit. After the tax is imposed, it must determine whether $24 is still the profit-maximizing price. Because the tax has not affected Comcast's marginal revenue or marginal cost (or had any effect on consumer demand), $24 is still the profit-maximizing price, and the company should continue to charge it. The tax reduces Comcast's profit but doesn't cause it to increase the price of cable subscriptions.

Your Turn: Test your understanding by doing related problem 3.6 at the end of the chapter.

Apply the Concept

A Monopoly on a Product Nobody Wants? The Cases of Washboards and Slide Rules

Over time, some products become obsolete, and firms stop making them. Consider the example of washboards, a product consisting of a wooden frame around rolls or strips of metal. Not many people today have ever used or seen a washboard. Prior to the adoption of electric washing machines beginning in the 1940s, many people would put their dirty clothes in a tub of hot water and detergent and rub them up and down over a washboard. Clearly, this process was messy, time-consuming, and very hard work! Not surprisingly, today, nearly everyone uses a washing machine to clean their clothes.

The number of U.S. firms manufacturing washboards has dwindled over time, but one firm still survives. The Columbus Washboard Company, located in Logan, Ohio, was founded in 1895 and continues in business. The company's output peaked in 1941, when it manufactured 1.3 million washboards. Today, the company employs four workers to produce about 11,000 washboards per year. Although some customers use its washboards to wash their clothes, the firm's website notes that its washboards are also "used as decorative pieces for laundry rooms and kitchens, as furniture accents, and as good old-fashioned American Bluegrass musical instruments." According to an article in *Smithsonian Magazine*, the firm's general manager estimated "that 40 percent of the company's sales are to people using them to wash clothes . . . 20 percent are sold for decoration and 40 percent are sold for use as musical instruments." The article notes that "washboards are considered percussion instruments, with players using any available tools to make noise on the rubbing surface."

As the sole producer of washboards in the United States, Columbus has a monopoly. Because the firm remains in business, we can conclude that the price it charges—$27.49 for its most popular model—must be at least equal to the firm's average total cost of production. But given the relatively low price of the firm's product and the relatively small quantity it produces, the firm's owners are unlikely to become wealthy as a result of their monopoly.

Let's consider another product that was once very popular but is now rarely used: the slide rule. A slide rule was about the same size as a ruler but with a movable wooden strip in the center that made it possible to use numbers imprinted on the slide rule to make numerical calculations. For decades, high school and college students used slide rules in their math and science courses, and dozens of U.S. firms manufactured them. By the 1970s, inexpensive pocket calculators produced by Hewlett-Packard and other firms quickly made the slide rule obsolete, and by 1976, all U.S. firms had stopped producing them.

PROUD TO BE AN AMERICAN
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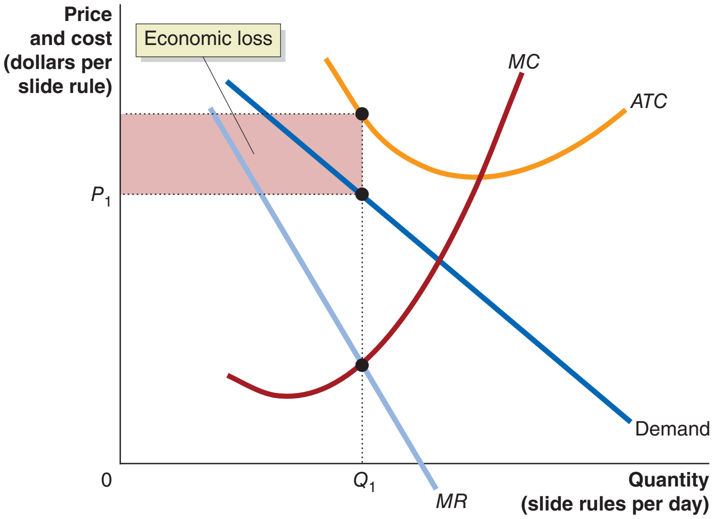
SUPPORT

Yvette Cardozo/Alamy Stock Photo

The Columbus Washboard Company in Ohio is the sole producer of washboards in the United States. Some people purchase washboards to wash clothes and others use them as either wall decor or musical instruments.

If you wanted to, you could start producing slide rules and become the slide rule monopolist of the United States. That no one else has beaten you to it indicates that it's not possible to break even manufacturing this product. As the following figure shows, at the profit-maximizing level of output, Q_1, price, P_1, is less than average total cost, so you would suffer a loss.



As we discussed in Chapter 12, Section 12.4, a firm that fails to at least break even won't continue to produce in the long run—even if it's a monopolist!

Your Turn: Test your understanding by doing related problem 3.8 at the end of this chapter.

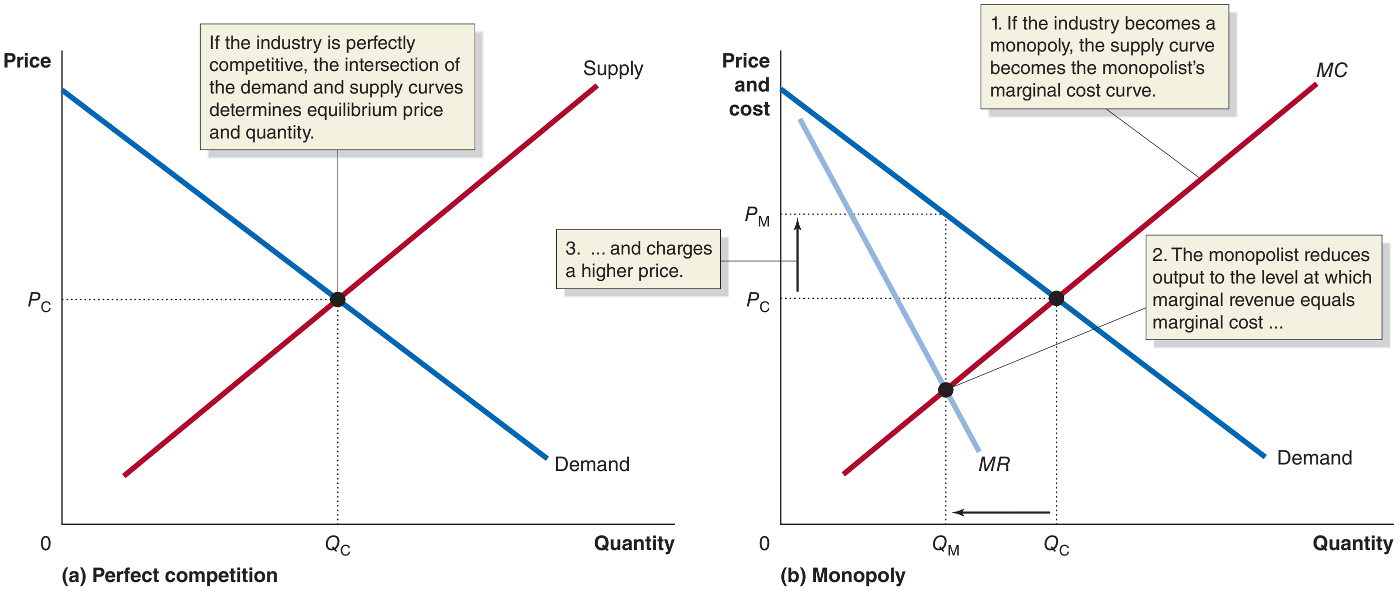
15.4 Does Monopoly Reduce Economic Efficiency?

LEARNING OBJECTIVE: Use a graph to illustrate how a monopoly affects economic efficiency.

We have seen that a perfectly competitive market is economically efficient (see Chapter 12, Section 12.6). How would economic efficiency be affected if, instead of being perfectly competitive, a market were a monopoly? *Economic surplus* provides a way of characterizing the economic efficiency in a market. *Equilibrium in a perfectly competitive market results in the greatest amount of economic surplus, or total benefit to society, from the production of a good or service* (see Chapter 4, Section 4.2). What happens to economic surplus under a monopoly? We can begin the analysis by considering the hypothetical case of what would happen if the market for reusable water bottles began as perfectly competitive and then became a monopoly.

Comparing Monopoly and Perfect Competition

Panel (a) in Figure 15.4 illustrates the situation if the market for water bottles is perfectly competitive. Price and quantity are determined by the intersection of the demand and supply curves. Remember that none of the individual firms in a perfectly competitive industry has any control over price. Each firm must accept the price determined by the market. Panel (b) shows what happens if the reusable water bottle market becomes a monopoly. We know that the monopoly will maximize profit by producing where marginal revenue equals marginal cost. To do this, the monopoly reduces the quantity of water bottles that would have been produced if the industry were perfectly competitive and increases the price. Panel (b) illustrates an important conclusion: *A monopoly will produce a smaller quantity and charge a higher price than would a perfectly competitive industry producing the same good.*



(a) Perfect competition

(b) Monopoly

Figure 15.4 **What Happens if a Perfectly Competitive Industry Becomes a Monopoly?**

In panel (a), the market for reusable water bottles is perfectly competitive, and price and quantity are determined by the intersection of the demand and supply curves. In panel (b), the perfectly competitive reusable water bottle market becomes a monopoly. As a result, we have the following:

1. The industry supply curve becomes the monopolist's marginal cost curve.
2. The monopolist reduces output to where marginal revenue equals marginal cost, Q_M.
3. The monopolist raises the price from P_C to P_M.

Measuring the Efficiency Losses from Monopoly

Figure 15.5 uses panel (b) from Figure 15.4 to illustrate how monopoly affects consumers, producers, and the efficiency of the economy. Recall that *consumer surplus* measures the net benefit received by consumers from purchasing a good or service (see Chapter 4, Section 4.1). We measure consumer surplus as the area below the demand curve and above the market price. The higher the price, the smaller the consumer surplus. Because a monopoly raises the market price, it reduces consumer surplus. In Figure 15.5, the loss of consumer surplus is equal to rectangle *A* plus triangle *B*. Remember that *producer surplus* measures the net benefit to producers from selling a good or service. We measure producer surplus as the area above the supply curve and below the market price. The increase in price due to monopoly increases producer surplus by an amount equal to rectangle *A* and reduces it by an amount equal to triangle *C*. Because rectangle *A* is larger than triangle *C*, we know that a monopoly increases producer surplus compared with perfect competition.

Economic surplus is equal to the sum of consumer surplus and producer surplus. By increasing price and reducing the quantity produced, the monopolist has reduced economic surplus by an amount equal to the areas of triangles *B* and *C*. The reduction in economic surplus shown in Figure 15.5 is called *deadweight loss* and represents the loss of economic efficiency due to monopoly.

The best way to understand how a monopoly causes a loss of economic efficiency is to recall that price is equal to marginal cost in a perfectly competitive market. As a result, a consumer in a perfectly competitive market is always able to buy a good if she is willing to pay a price equal to the marginal cost of producing it. As Figure 15.5 shows, the monopolist stops producing reusable water bottles at a point where the price is well above marginal cost. Consumers are unable to buy some water bottles for which they would be willing to pay a price greater than the marginal cost of producing them. Why doesn't the monopolist produce these additional bottles? Because the monopolist's profit is greater if it restricts output and forces up the price. A monopoly produces the profit-maximizing level of output but fails to produce the efficient level of output from the point of view of society.

We can summarize the effects of monopoly as follows:

1. Monopoly causes a *decrease* in consumer surplus.
2. Monopoly causes an *increase* in producer surplus.
3. Monopoly causes a deadweight loss, which represents a reduction in economic efficiency.

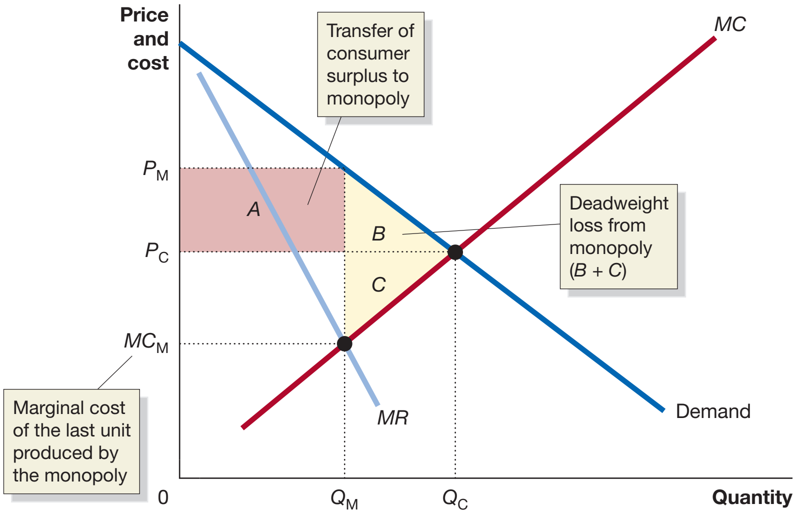


Figure 15.5

The Inefficiency of Monopoly

A monopoly charges a higher price, P_M, and produces a smaller quantity, Q_M, than a perfectly competitive industry, which charges price P_C and produces Q_C. The higher price reduces consumer surplus by the area equal to the rectangle *A* and the triangle *B*. Some of the reduction in consumer surplus is captured by the monopoly as producer surplus, and some becomes deadweight loss, which is the area equal to triangles *B* and *C*.

How Large Are the Efficiency Losses Due to Monopoly?

Market power The ability of a firm to charge a price greater than marginal cost.

We know that there are few monopolies, so the loss of economic efficiency due to monopoly must be small. Many firms, though, have **market power**, which is the ability of a firm to charge a price greater than marginal cost. The analysis we just completed shows that some loss of economic efficiency will occur whenever a firm has market power and can charge a price greater than marginal cost, even if the firm is not a monopoly. The only firms that do *not* have market power are firms in perfectly competitive markets, which must charge a price equal to marginal cost. Because few markets are perfectly competitive, *some loss of economic efficiency occurs in the market for nearly every good or service.*

Is the total loss of economic efficiency due to market power large or small? It is possible to put a dollar value on the loss of economic efficiency by estimating for every industry the size of the deadweight loss triangle, as in Figure 15.5. The first economist to do this was Arnold Harberger of the University of California, Los Angeles. His estimates—largely confirmed by later researchers—indicated that the total loss of economic efficiency in the U.S. economy due to market power is relatively small. According to his estimates, if every industry in the economy were perfectly competitive, so that price were equal to marginal cost in every market, the gain in economic efficiency would equal less than 1 percent of the value of total production in the United States, or about $786 per person.

The loss of economic efficiency is small primarily because true monopolies are very rare. In most industries, competition keeps price much closer to marginal cost than would be the case in a monopoly. The closer price is to marginal cost, the smaller the size of the deadweight loss.

Market Power and Technological Change

Some economists argue that the economy may actually benefit from firms having market power. This argument is most closely identified with Joseph Schumpeter, an Austrian economist who spent many years as a professor of economics at Harvard. Schumpeter argued that economic progress depends on technological change in the form of new products. For example, the replacement of horse-drawn carriages by automobiles, the replacement of ice boxes by refrigerators, and the replacement of mechanical calculators by electronic computers all represent technological change that significantly raised living standards. In Schumpeter's view, new products unleash a "gale of creative destruction" that drives older products—and, often, the firms that produce them—out of the market. Schumpeter was not concerned that firms with market power would charge higher prices than perfectly competitive firms:

> It is not that kind of [price] competition which counts but the competition from the new commodity, the new technology, the new source of supply, the new type of organization . . . competition which commands a decisive cost or quality advantage and which strikes not at the margins of the profits and outputs of the existing firms but at their foundations and their very lives.

Economists who support Schumpeter's view argue that the introduction of new products requires firms to spend funds on research and development. It is possible for firms to raise this money by borrowing from investors or banks. But investors and banks are usually skeptical of ideas for new products that have not yet passed the test of consumer acceptance in the market. As a result, firms are often forced to rely on their profits to finance the research and development needed for new products. Because firms with market power are more likely to earn an economic profit than are perfectly competitive firms, they are also more likely to carry out research and development and launch new products. In this view, the benefits that consumers receive from these new products outweigh the higher prices firms with market power charge.

Some economists disagree with Schumpeter's views. These economists point to the number of new products developed by smaller firms, including, for example, Steve Jobs and Steve Wozniak inventing the first Apple computer in Jobs's garage, and Larry Page and Sergey Brin inventing the Google search engine as graduate students at Stanford. As we will see in Section 15.6, government policymakers continue to struggle with the issue of whether, on balance, large firms with market power are good or bad for the economy.

15.5 Price Discrimination: Charging Different Prices for the Same Product

LEARNING OBJECTIVE: Explain how a firm can increase its profits through price discrimination.

We've been assuming that a monopolist, like other businesses, maximizes profit by charging the single price that results in selling the quantity where marginal revenue equals marginal cost. But sometimes we see firms charging customers different prices based on differences in the willingness of customers to pay for the product. For example, the Walt Disney Company charges different prices for tickets to its Walt Disney World resort in Florida, depending on a person's age, state or country of residence, whether the person is serving in the military, and the day of the year.

Charging different prices to different customers for the same good or service when the price differences are not due to differences in cost is called **price discrimination**.

Price discrimination The practice of charging different prices to different customers for the same good or service when the price differences are not due to differences in cost.

The Requirements for Successful Price Discrimination

To successfully practice price discrimination, a firm must:

1. Possess market power.
2. Have some customers with a greater willingness to pay for the product than other customers and be able to identify which customers have the greater willingness to pay.
3. Be able to divide up—or *segment*—the market for the product so that consumers who buy the product at a low price are not able to resell it at a high price.

A firm selling in a perfectly competitive market cannot practice price discrimination because it can only charge the market price. For example, a farmer will be unable to sell any eggs at a price higher than the market price because consumers have many other farmers they can buy eggs from. Because most firms do not sell in a perfectly competitive market, even if they are not a monopoly, they have market power and can set the price of the goods they sell.

Many firms may also be able to determine that some consumers have a greater willingness to pay for a product than others. However, it can be difficult to fulfill the third requirement—that markets be segmented so that consumers buying at a low price will not be able to resell the product. According to the *law of one price*, identical products should sell for the same price everywhere. For example, some people really love Big Macs and would be willing to pay $10 rather than do without one. Other people would not be willing to pay a penny more than $3 for a Big Mac. Even if McDonald's could identify differences in the willingness of consumers to pay for Big Macs, it would not be able to charge them different prices. Suppose McDonald's knows that Joe is willing to pay $10, whereas Jill will pay only $3. If McDonald's tries to charge Joe $10, he will just have Jill buy a Big Mac for him, perhaps paying her $3.50.

Buying a product at a low price and reselling it at a high price is called *arbitrage*. The profits received from engaging in arbitrage are called *arbitrage profits*. The incentive provided by arbitrage profits should result in the law of one price holding for every product—unless a firm can find a way to keep arbitrage from occurring.

An Example of Price Discrimination

Only firms that can keep consumers from reselling a product are able to practice price discrimination. When buyers cannot resell the product, the law of one price does *not* hold. For example, movie theaters know that many people are willing to pay more to see a movie in the evening than during the afternoon. As a result, theaters usually charge higher prices for tickets to evening showings than for tickets to afternoon showings. Theaters keep these markets separate by making the tickets to afternoon showings a different color or by having the time printed on them and by having a ticket taker examine the tickets. These practices make it difficult for someone to buy a lower-priced ticket in the afternoon and use it to gain admission to an evening showing.

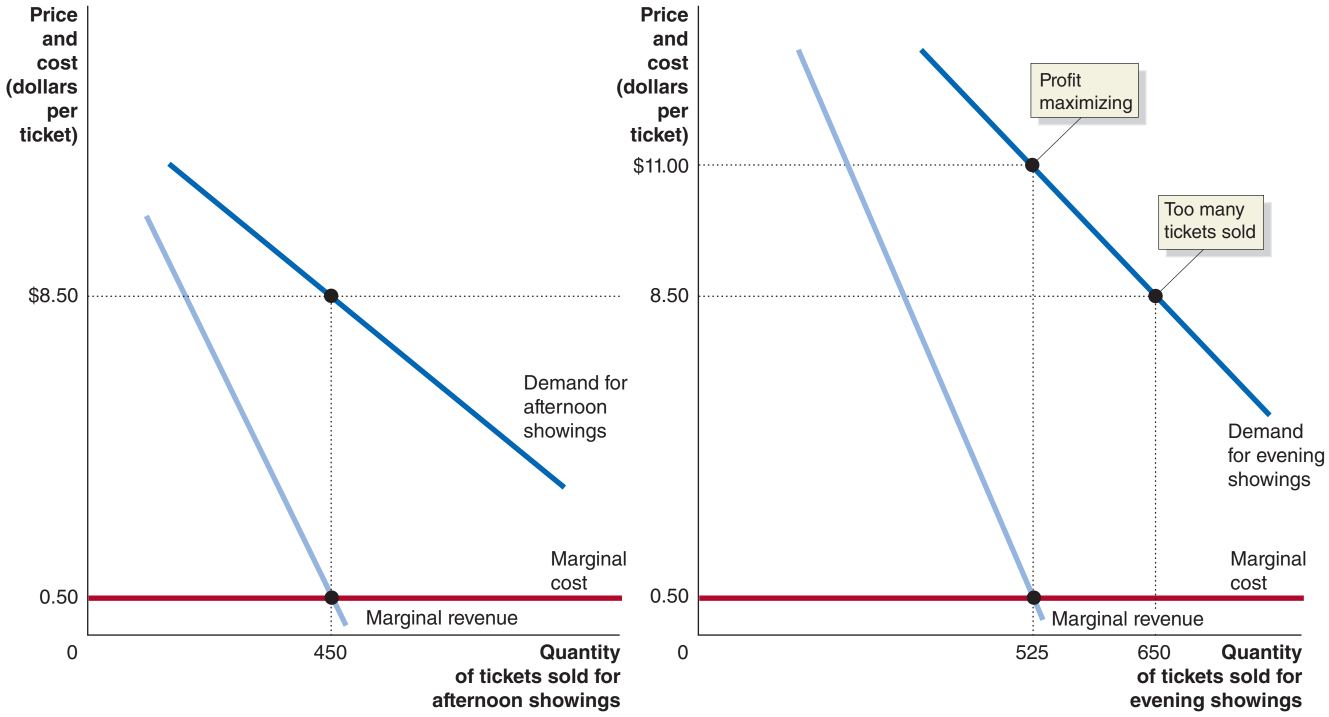
Don't Let This Happen to You

Don't Confuse Price Discrimination with Other Types of Discrimination

Price discrimination is not the same as discrimination based on race or gender. Discriminating on the basis of arbitrary characteristics, such as race or gender, is illegal under the federal government's civil rights laws. Price discrimination is legal because it involves charging people different prices on the basis of their willingness to pay rather than on the basis of arbitrary characteristics. There is a gray area, however, when companies charge different prices on the basis of gender. For example, insurance companies usually charge women lower prices than men for automobile insurance. The courts have ruled that this is not illegal discrimination under the civil rights laws because women, on average, have better driving records than men. Because the costs of insuring men are higher than the costs of insuring women, insurance companies are allowed to charge men higher prices. Notice, though, that this is not actually price discrimination as we have defined it here. Price discrimination involves charging different prices for the same product *where the price differences are not due to differences in cost.*

Your Turn: Test your understanding by doing related problem 5.11 at the end of the chapter.

Figure 15.6 illustrates how the owners of movie theaters use price discrimination to increase their profits. The marginal cost to the movie theater owner from another person attending a showing is very small: a little more wear on a theater seat and a little more popcorn to sweep from the floor. In previous chapters, we assumed that the marginal cost curve has a U shape. In Figure 15.6, we assume for simplicity that marginal cost is a constant $0.50, shown as a horizontal line. Panel (a) shows the demand for afternoon showings. In this segment of its market, the theater should maximize profit by selling the quantity of tickets for which marginal revenue equals marginal cost, or 450 tickets. We know from the demand curve that the theater can sell 450 tickets at a price of $8.50 per ticket. Panel (b) shows the demand for evening showings. Notice that charging $8.50 per ticket would *not* be profit maximizing



(a) Afternoon showings

(b) Evening showings

Figure 15.6 **Price Discrimination by a Movie Theater**

Fewer people want to go to movies in the afternoon than in the evening. In panel (a), the profit-maximizing price for a ticket to an afternoon showing is $8.50. Charging this same price for evening showings would not be profit maximizing, as panel (b) shows. At a price of $8.50, the theater would sell 650 tickets to evening showings, which is more than the profit-maximizing number of 525 tickets. To maximize profit, the theater should charge $11.00 for tickets to evening showings.

in this market. At a price of $8.50, the theater sells 650 tickets, which is 125 more tickets than the profit-maximizing quantity of 525. By charging $8.50 for tickets to afternoon showings and $11.00 for tickets to evening showings, the theater maximizes profit.

Figure 15.6 also illustrates another important point about price discrimination: When firms can practice price discrimination, they will charge customers who are less sensitive to price—those whose demand for the product is *less elastic*—a higher price and charge customers who are more sensitive to price—those whose demand is *more elastic*—a lower price. In this case, the demand for tickets to evening showings is less elastic, so the price charged is higher, and the demand for tickets to afternoon showings is more elastic, so the price charged is lower.

Solved Problem 15.5

How Apple Uses Price Discrimination to Increase Profits

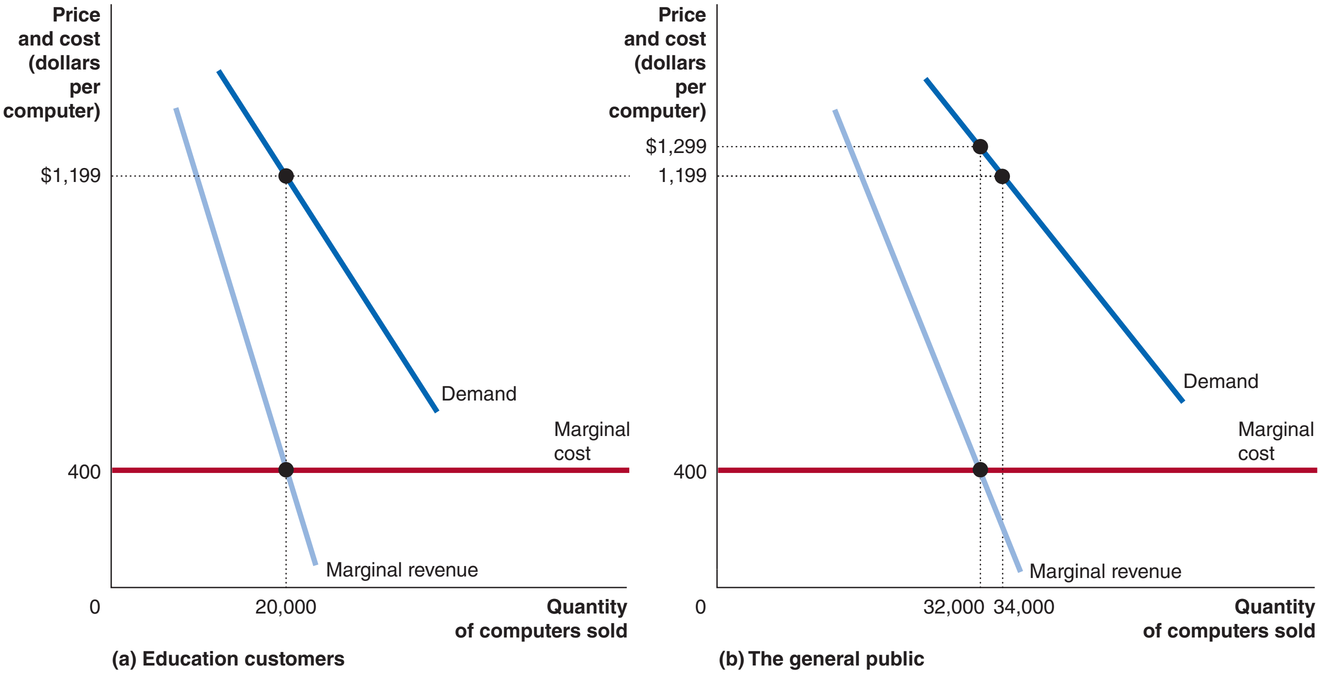
In mid-2023, Apple was selling MacBook Air laptop computers with an M2 chip and a 10-core GPU on its website and in its retail stores for $1,299. But college students and faculty members could buy the same laptop from Apple for $1,199. Why would Apple charge different prices for the same laptop, depending on whether the buyer is an education customer? Draw two graphs to illustrate your answers: one for the general public and one for education customers.

Solving the Problem

Step 1: **Review the chapter material.** This problem is about using price discrimination to increase profits, so you may want to review the section “Price Discrimination: Charging Different Prices for the Same Product.”

Step 2: **Explain why charging different prices to education customers and other customers will increase Apple’s profit.** It makes sense for Apple to charge different prices if education customers have a different price elasticity of demand than do other customers. In that case, Apple will charge the market segment with the less elastic demand a higher price and the market segment with the more elastic demand a lower price. Because Apple is charging education customers the lower price, they must have a more elastic demand than do other customers.

Step 3: **Draw graphs to illustrate your answer.** Your graphs should look like the following ones, where we have chosen hypothetical quantities to illustrate the ideas. As in the case of movie theaters, you can assume for simplicity that marginal cost is constant; in the graphs we assume that marginal cost to Apple of producing laptops is a constant $400.



(a) Education customers (b) The general public

Panel (a) shows that in the education customers segment of the market, marginal revenue equals marginal cost at 20,000 laptops sold. Therefore, Apple should charge a price of $1,199 to maximize profits. But if Apple also charges $1,199 in the general public segment of the market, shown in panel (b), it will sell 34,000 laptops, which is more than the profit-maximizing quantity. By charging $1,299 to the general public, Apple will sell 32,000 laptops, the profit-maximizing quantity. We have shown that Apple maximizes its profits by charging education customers a lower price than it charges the general public.

Your Turn: For more practice, do related problem 5.12 at the end of this chapter.

Airlines: The Kings of Price Discrimination

Airline seats are a perishable product. Once a plane has taken off from Chicago for Los Angeles, any seat that has not been sold on that particular flight will never be sold. In addition, the marginal cost of flying one additional passenger is low. As a result, airlines have a strong incentive to manage prices to fill as many seats as possible on each flight. Airlines divide their customers into two main categories: business travelers and leisure travelers. Table 15.1 compares the characteristics of these two groups and how airlines treat them differently.

Table 15.1

How Airlines Maximize Profit by Charging Different Ticket Prices

Category of Traveler	Schedule of the Traveler	Traveler's Sensitivity to Price	How Do Airlines Maximize Profits?	Example of Price Difference
Business traveler 	Inflexible. May need to buy ticket the week or day of travel.	Not very sensitive to price.	Charge business travelers higher ticket prices than leisure travelers.	In the fall of 2023, a business-fare ticket between New York and San Francisco on United Airlines was $528.
Leisure traveler 	Flexible. Can buy ticket weeks in advance.	Sensitive to price.	Charge leisure travelers lower ticket prices than business travelers.	In the fall of 2023, a leisure-fare ticket between New York and San Francisco on United Airlines was only $222.

top: LightField Studios/Shutterstock; bottom: Yelizaveta Tomashevska/Alamy Stock Photo

The airlines go well beyond a single leisure fare and a single business fare in their pricing strategies. Although they ordinarily charge high prices for tickets sold only a few days in advance, airlines are willing to reduce prices even if the flight is the next day for seats that they doubt they will be able to sell at current prices. Since the late 1980s, airlines have employed economists and mathematicians to construct computer models of the market for airline tickets. To calculate a suggested price each day for each seat, these models take into account factors that affect the demand for tickets, such as the season of the year, the length of the route, the day of the week, and whether the flight typically attracts primarily business or leisure travelers. This practice of continually adjusting prices to take into account fluctuations in demand is called *yield management*.

Internet sites help the airlines implement yield management. Several airlines collectively operate the internet site Orbitz, which provides another means of filling seats at discount prices. Expedia, Priceline, Kayak, and Google Flights compete with Orbitz and also help airlines determine the prices necessary to sell particular seats on particular flights. Typically, prices on these sites adjust very quickly, sometimes within a few minutes of being posted. Because most people book flights using these sites rather than contacting individual airlines directly, it's very likely that you paid a different price for your airline ticket than did the person sitting next to you.

Big Data and Dynamic Pricing

Firms have found it easier to determine consumers' preferences by using *big data*, which refers to the collection and analysis of massive amounts of data, with the goal of measuring aspects of people's behavior. Firms can use *machine learning models* to analyze big data. The results of this analysis can help firms to predict how responsive different groups of customers are to changes in price—in other words, how successfully the firms can engage in price discrimination. Because the word *discrimination* has unfavorable connotations, many firms call their pricing strategies *yield management*, *price optimization*, or *dynamic pricing*. The last term has become popular because it reflects the idea that prices are continually adjusted as new data become available.

Let's consider examples of firms using big data to make pricing decisions.

The Walt Disney Company Big data helps Disney answer questions such as: Do people who stay in the most expensive Disney World hotels visit the parks for more hours than people who stay in less expensive hotels? How much do sales of souvenirs decline when Disney increases their prices?

Disney visitors wear MagicBands around their wrists or use an app on their smartphones to enter the parks and buy souvenirs, pay for meals, and enter rides. Disney has increased its ability to collect data using these bands and apps because the data move directly from the bands or apps into Disney's information technology system. The bands are part of the *Internet of Things*—networks of devices that directly communicate data to computers, without the need for a person to enter the data. The MagicBands program and associated technology have cost Disney about $1 billion to implement. This investment indicates that gathering and analyzing data on its customers' preferences is very important to the company.

Airlines Airlines' initial efforts at price discrimination didn't require much data. Today, airlines charge many different prices on most flights, and the prices are determined by sophisticated software that processes huge amounts of data on many factors that might affect the responsiveness of passengers to changes in ticket prices on a particular flight, such as whether the flight attracts primarily leisure travelers or primarily business travelers; the weather forecast in the originating and destination cities; how many flights competing airlines are offering; the number of seats currently unsold on this flight and competing flights; and whether conventions, large professional conferences, major concerts, or sporting events are occurring in the destination city. For example, analysis of big data indicated that leisure travelers are more likely to book fares during a weekend, while business travelers are more likely to book fares on Friday for the following week. As a result, one study found that airlines charge prices that are 13 percent higher on tickets sold on Fridays than on tickets sold on Sundays. Similar pricing strategies have become widespread.

The AMC Movie Theater Chain and the New York Yankees Usually, when you go to the movies, all the tickets for a showing at a particular time have the same price. You don't pay any more for a seat in a middle row with a perfect view of the screen than you do for a seat in the front row where you may get a sore neck watching the film. AMC is the world's largest movie chain. In 2023, AMC began charging different prices for different seats at showings after 4 P.M. According to an article on bloomberg.com, "The price of standard seats won't change, while 'value' seats—such as in the front row—will cost less than standard tickets. Preferred seats, including those in the middle rows, will cost more." Initially, preferred seats had a price $1 more than standard seats, and value seats had a price $2 less. An article in the *New York Times* quoted the founder of the MoviePass subscription movie ticket app as saying: "The big theater chains are gaining the technology to implement variable pricing on a wide scale."

AMC's chief marketing officer noted that sports arenas and concerts have long charged different prices for different seats. For instance, the New York Yankees practice price discrimination both in terms of what they charge for different seats in Yankee Stadium and what they charge for seats to games with more popular opponents. For a game against the Oakland Athletics in May 2023, the Yankees charged $28.66 for a seat in the outfield bleachers, $332.97 for a seat along the third base line, and $1,834.66 for a seat very close to the field. The Yankees charged higher prices for all of those seats for a June game against their archrivals, the Boston Red Sox.

Amazon and Other Online Retailers Online retailers such as Amazon have become skilled at analyzing big data. When you log on to a website, its servers can gather important information about you, including your location—which can be determined from your Internet Protocol (IP) address—and your browsing history. If the site already has your e-mail address, it may be able to use an internet data firm to discover your age, race, gender, and income and adjust prices on the basis of this information. One conclusion retailers have drawn is that because more consumers are online during the workday, it makes sense to raise prices in the morning and reduce them in the evening. Some retailers have gone beyond such simple changes and implemented sophisticated data-based pricing strategies, although they are often reluctant to discuss them publicly.

Automobile Insurance Companies Automobile insurance companies typically call their pricing strategies *price optimization*. Because the rates insurance companies charge usually have to be approved by state government agencies, some of the companies' price optimization policies have been the subject of public debate. Typically, automobile insurance companies have set policy premiums on the basis of the likelihood of a policyholder having an accident. For example, data show that young unmarried males are more likely to have accidents than are people in other demographic groups. Similarly, drivers who have previously had an accident are more likely to have future accidents than are drivers who have not had accidents. So, those groups are charged higher premiums. In recent years, though, some insurance companies have used analysis of big data to charge higher premiums not just for high-risk drivers but also for drivers who are likely to have a lower responsiveness to premium increases. For example, people who have only a high school education or who have continued to purchase a policy from the same company over many years tend to be less responsive to premium increases than are people with college degrees or who change companies frequently. Some state regulatory agencies are critical of these pricing strategies and have been pressuring insurance companies to return to setting premiums primarily on the basis of how likely a driver is to have an accident.

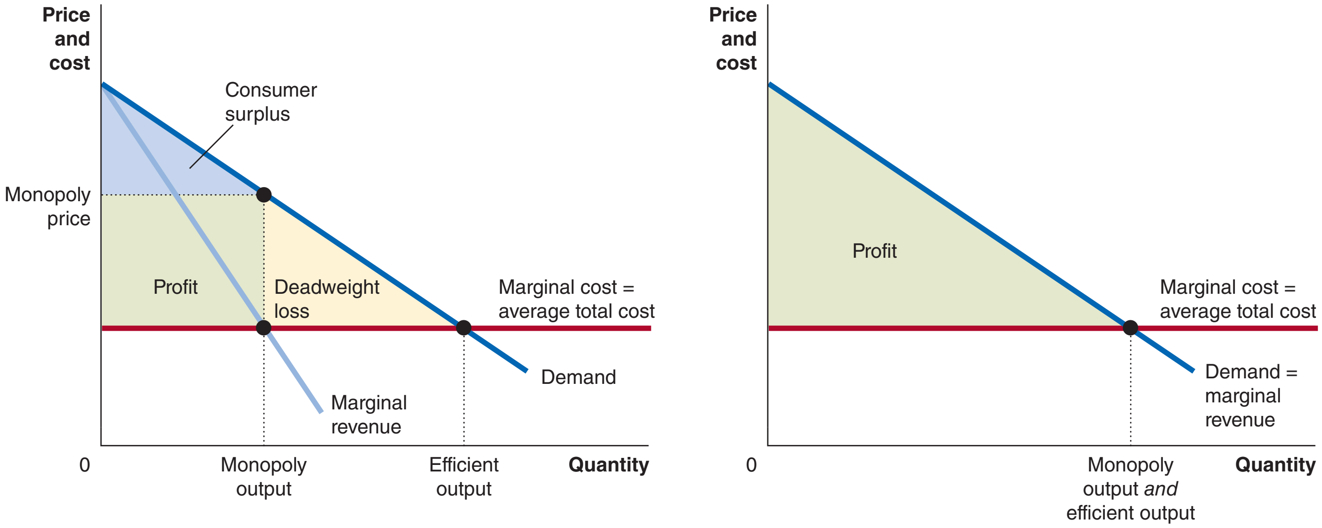
When firms adopt pricing strategies like the ones we've described, typically some consumers gain by paying lower prices, while other consumers lose by paying higher prices. As a group, though, consumers lose because, if successful, dynamic pricing strategies increase firms' revenues. The more consumers pay for the same quantity of goods, the worse off they are.

Perfect Price Discrimination

If a firm knew every consumer's willingness to pay and could prevent consumers who bought a product at a low price from reselling it, the firm could charge every consumer a different price. In this case of *perfect price discrimination*—also known as *first-degree price discrimination*—each consumer would have to pay a price equal to the consumer's willingness to pay and, therefore, would receive no consumer surplus. To see why, remember that consumer surplus is the difference between the highest price a consumer is willing to pay for a product and the price the consumer actually pays (see Chapter 4, Section 4.1). But if the price the consumer pays is the maximum he or she would be willing to pay, there is no consumer surplus.

Figure 15.7 shows the effects of perfect price discrimination. To simplify the discussion, we assume that the firm is a monopoly and that it has constant marginal and average total costs. Panel (a) shows the case of a monopolist that cannot practice price discrimination and, therefore, can charge only a single price for its product. The monopolist maximizes profit by producing the level of output where marginal revenue equals marginal cost. Recall that the economically efficient level of output occurs where price is equal to marginal cost, which is the level of output in a perfectly competitive market. Because the monopolist produces where price is greater than marginal cost, the monopolist causes a loss of economic efficiency equal to the area of the deadweight loss triangle in the figure.

Panel (b) shows the situation of a monopolist practicing perfect price discrimination. Because the firm can charge each consumer the maximum he or she is willing to pay, its marginal revenue from selling one more unit is equal to the price of that unit. Therefore, the monopolist's marginal revenue curve becomes equal to its demand curve, and the firm will continue to produce up to the point where price is equal to marginal cost. It may seem like a paradox, but the ability to practice perfect price discrimination causes the monopolist to produce the efficient level of output. By doing so, the monopolist converts the consumer surplus *and* the deadweight loss in panel (a) into profit. In both panel (a) and panel (b), the profit shown is also producer surplus.



(a) A monopolist that cannot practice price discrimination

(b) A monopolist practicing perfect price discrimination

Figure 15.7 **Perfect Price Discrimination**

Panel (a) shows the case of a monopolist that cannot practice price discrimination and, therefore, can charge only a single price for its product. The graph shows that to maximize profit, the monopolist will produce the level of output where marginal revenue equals marginal cost. The area of the green-shaded rectangle shows the resulting profit. Given the monopoly price, the area of the blue-shaded triangle shows the amount of consumer surplus in this market. The economically efficient level of output occurs where price equals marginal cost. Because the monopolist stops production at a level of output where price is above marginal cost, there is a deadweight loss equal to the area of the yellow-shaded triangle. In panel (b), the monopolist is able to practice perfect price discrimination by charging a different price to each consumer. The result is to convert both the consumer surplus *and* the deadweight loss from panel (a) into profit.

Even though the result in panel (b) is more economically efficient than the result in panel (a), consumers clearly are worse off because the amount of consumer surplus has been reduced to zero. We probably will never see a case of perfect price discrimination in the real world because firms typically do not know how much each consumer is willing to pay and, therefore, cannot charge each consumer a different price. Still, this extreme case helps us to see the two key results of price discrimination:

1. Profit increases.
2. Consumer surplus decreases.

Perfect price discrimination improves economic efficiency. Can we also say that this will be the case if price discrimination is less than perfect? Often, less-than-perfect price discrimination will improve economic efficiency. But under certain circumstances, it may actually reduce economic efficiency, so we can't draw a general conclusion.

Price Discrimination across Time

Firms are sometimes able to engage in price discrimination over time. With this strategy, firms charge a higher price for a product when it is first introduced and a lower price later. Some consumers are *early adopters* who will pay a high price to be among the first to own certain new products. This fact helps explain why products such as Blu-ray players and 4K televisions sold for very high prices when they were first introduced. After the demand of the early adopters was satisfied, the companies reduced prices to attract more price-sensitive customers. For example, the price of Blu-ray players dropped by 95 percent within five years of their introduction. Some of the price reductions over time for these products were also due to falling costs, as companies took advantage of economies of scale, but some represented price discrimination across time.

Book publishers routinely use price discrimination across time to increase profits. Hardcover editions of novels have much higher prices and are published months before paperback editions. For example, the hardcover edition of Stephen King's novel *Fairy Tale* was published in September 2022 at a price of $32.50. The paperback edition was published in June 2023 for $20.00. Although this difference in price might seem to reflect the higher costs of producing hardcover books, in fact, it does not. The marginal cost of printing another copy of the hardcover edition is about $1.50. The marginal cost of printing another copy of the paperback edition is only slightly less, about $1.25. So, the difference in price between the hardcover and paperback editions is explained primarily by differences in demand. Stephen King's most devoted fans want to read his next book at the earliest possible moment and are not very sensitive to price. Many casual readers are also interested in his books but will read something else if the price of his latest book is too high. A publisher will maximize profit by segmenting the market—in this case, across time—and by charging a higher price to the less elastic market segment and a lower price to the more elastic segment.

Can Price Discrimination Be Illegal?

As we will see in Section 15.6, Congress has passed *antitrust laws* to promote competition. Price discrimination may be illegal if its effect is to reduce competition in an industry. In 1936, Congress passed the Robinson-Patman Act, which outlawed price discrimination that reduced competition. The act also contained language that could be interpreted as making illegal *all* price discrimination not based on differences in cost. In the 1960s, the Federal Trade Commission sued Borden, Inc., under this act because Borden was selling the same evaporated milk for two different prices. Cans with the Borden label were sold for a high price, and cans the company sold to supermarkets to be repackaged as the supermarkets' private brands were sold for a much lower price. The courts ultimately ruled that Borden had not violated the law because the price differences increased, rather than reduced, competition in the market for evaporated milk. In recent years, the courts have interpreted the Robinson-Patman Act narrowly, allowing firms to use the types of price discrimination described in this chapter.

15.6 Government Policy toward Monopoly

LEARNING OBJECTIVE: Explain how the government regulates monopoly.

Because monopolies reduce consumer surplus and economic efficiency, most governments have policies that regulate their behavior. **Collusion** refers to an agreement among firms to charge the same price or otherwise not to compete (see Chapter 14, Section 14.2). In the United States, *antitrust laws* are designed to prevent monopolies and deter collusion among firms in all market structures. Governments also regulate firms that are natural monopolies, often by controlling the prices they charge.

Collusion An agreement among firms to charge the same price or otherwise not to compete.

Antitrust Laws and Antitrust Enforcement

The first important law regulating monopolies in the United States was the Sherman Act, which Congress passed in 1890 to promote competition and prevent the formation of monopolies. Section 1 of the Sherman Act outlaws "every contract, combination in the form of trust or otherwise, or conspiracy in restraint of trade." Section 2 states that "every person who shall monopolize, or attempt to monopolize, or combine or conspire with any other person or persons, to monopolize any part of the trade or commerce . . . shall be deemed guilty of a felony."

The Sherman Act targeted firms in several industries that had combined during the 1870s and 1880s to form "trusts." In a trust, the firms were operated independently but gave voting control to a board of trustees. The board enforced collusive agreements for the firms to charge the same price and not to compete for each other's customers. The most notorious of the trusts was the Standard Oil Trust, organized by John D. Rockefeller. In the years following passage of the Sherman Act, business trusts disappeared, but the term **antitrust laws** has lived on to refer to the laws aimed at eliminating collusion and promoting competition among firms.

Antitrust laws Laws aimed at eliminating collusion and promoting competition among firms.

The Sherman Act prohibited trusts and collusive agreements, but it left several loopholes. For example, it was not clear whether it would be legal for two or more firms to merge to form a new, larger firm that would have substantial market power. A series of Supreme Court decisions interpreted the Sherman Act narrowly, and the result was a wave of mergers at the turn of the twentieth century. Included in these mergers was U.S. Steel Corporation, which was formed from dozens of smaller companies. U.S. Steel, organized by the financier J.P. Morgan, was the first billion-dollar corporation, and it initially controlled two-thirds of steel production in the United States. The Sherman Act also left unclear whether any business practices short of outright collusion were illegal.

To address the loopholes in the Sherman Act, in 1914, Congress passed the Clayton Act and the Federal Trade Commission Act. Under the Clayton Act, a merger was illegal if its effect was "substantially to lessen competition, or to tend to create a monopoly." The Federal Trade Commission Act set up the Federal Trade Commission (FTC), which was given the power to police unfair business practices. The FTC has brought lawsuits against firms employing a variety of business practices, including deceptive advertising. In setting up the FTC, Congress divided the authority to police mergers. Currently, both the Antitrust Division of the U.S. Department of Justice (DOJ) and the FTC are responsible for merger policy. Table 15.2 lists the most important U.S. antitrust laws and the purpose of each.

Mergers: The Trade-off between Market Power and Efficiency

The federal government regulates business mergers because if firms gain market power by merging, they may use that market power to raise prices and reduce output. As a result, the government is most concerned with **horizontal mergers**, or mergers between firms in the same industry. A merger of two airlines or a merger of two candy manufacturers would be a horizontal merger. Horizontal mergers are more likely to increase market power than **vertical mergers**, which are mergers between firms at different stages in the production of a good. An example of a vertical merger would be a merger between a company making soft drinks and a company making plastic bottles.

Horizontal merger A merger between firms in the same industry.

Vertical merger A merger between firms at different stages in the production of a good.

Table 15.2

Important U.S. Antitrust Laws

Law	Date Enacted by Congress	Purpose
Sherman Act	1890	Prohibited "restraint of trade," including price fixing and collusion. Also outlawed monopolization.
Clayton Act	1914	Prohibited firms from buying stock in competitors and from having directors serve on the boards of competing firms.
Federal Trade Commission Act	1914	Established the Federal Trade Commission (FTC) to help administer antitrust laws.
Robinson–Patman Act	1936	Prohibited firms from charging buyers different prices if the result would reduce competition.
Celler–Kefauver Act	1950	Toughened restrictions on mergers by prohibiting any mergers that would reduce competition.

Federal regulators deal with two factors that can complicate the evaluation of horizontal mergers:

1. **The extent of the market.** The "market" that firms are in is not always clear. For example, if Hershey Foods wants to merge with Mars, Inc., maker of M&Ms, Snickers, and other candies, what is the relevant market?
    - If the government looks just at the candy market, the newly merged company would have more than 70 percent of the market, a level at which the government would likely oppose the merger.
    - If the government looks at the broader market for snacks, Hershey and Mars compete with makers of potato chips, pretzels, and peanuts—and perhaps even producers of fresh fruit. With this broader definition of the market, the market shares of Hershey and Mars would likely be too low for federal regulators to oppose their merger.
    - If the government looked at the very broad market for food, then both Hershey and Mars have very small market shares, and there would be no reason for federal regulators to oppose their merger.

    In practice, the government defines the relevant market on the basis of whether there are close substitutes for the products being made by the merging firms. In this case, potato chips and the other snack foods mentioned are not close substitutes for candy. So, the government would consider the candy market to be the relevant market and would oppose the merger, on the grounds that the new firm would have too much market power.

2. **Possible increases in economic efficiency.** The second factor that complicates merger policy is the possibility that the newly merged firm might be more efficient than the merging firms were individually. For example, one firm might have an excellent product but a poor distribution system for getting the product into the hands of consumers. A competing firm might have built a great distribution system but have an inferior product. Allowing these firms to merge might be good for both the firms and consumers. Or, two competing firms might each have an extensive system of warehouses that are only half full, but if the firms merged, they could consolidate their warehouses and significantly reduce their average costs.

Most of the mergers that come under the scrutiny of the Department of Justice and the FTC are between large firms. For simplicity, though, let's consider a case in which all the firms in a perfectly competitive industry want to merge to form a monopoly. As we saw in Figure 15.5, as a result of such a merger, prices will rise and output will fall, leading to a decline in consumer surplus and economic efficiency. But what if the larger, newly merged firm actually is more efficient than the smaller firms were? In that case, it's possible to have the following seemingly paradoxical result: *The newly merged firm has a great deal of market power, but consumers are better off and economic efficiency is increased because the firm is more efficient*. Of course, sometimes a merged firm will be more efficient and have lower costs, and other times it won't. Even if a merged firm is more efficient and has lower costs, the lower costs may not offset the increased market power of the firm enough to increase consumer surplus and economic efficiency.

As you might expect, whenever large firms propose a merger, they claim that the newly merged firm will be more efficient and have lower costs. They realize that without these claims, the Department of Justice and the FTC, along with the court system, are unlikely to approve the merger.

The Department of Justice and FTC Merger Guidelines and the Herfindahl-Hirschman Index of Concentration

For many years after the passage of the Sherman Act in 1890, lawyers from the Department of Justice enforced the antitrust laws. The lawyers rarely considered the economic consequences of mergers. In 1973, Congress established the Economics Section of the Antitrust Division. The economists who work in this division evaluate the economic consequences of proposed mergers.

Economists played a major role in the development of merger guidelines by the Department of Justice and the FTC in 1982. The guidelines made it easier for firms considering a merger to understand whether the government was likely to allow the merger or to oppose it. The guidelines have three main parts:

1. Market definition
2. Measure of concentration
3. Merger standards

Market Definition A market consists of all firms making products that consumers view as close substitutes. Economists can identify close substitutes by looking at the effect of a price increase. If the definition of a market is too narrow, a price increase will cause firms to experience a significant decline in sales—and profits—as consumers switch to buying close substitutes.

Identifying the relevant market involved in a proposed merger begins with a narrow definition of the industry. For a hypothetical merger of Hershey Foods and Mars, Inc., economists might start with the candy industry. If all firms in the candy industry increased price by 5 percent, would their profits increase or decrease? If profits would increase, the market is defined as being just these firms. If profits would decrease, economists would try a broader definition—say, by adding in potato chips and other snacks. Would a price increase of 5 percent by all firms in the broader market raise profits? If profits increase, the relevant market has been identified. If profits decrease, economists consider a broader definition. Economists continue the process until a market has been identified.

Measure of Concentration A market is *concentrated* if a relatively small number of firms have a large share of total sales in the market. A merger between firms in a market that is already highly concentrated is very likely to increase market power. A merger between firms in an industry that has a very low concentration is unlikely to increase market power and can be ignored. The guidelines use the *Herfindahl-Hirschman Index* (*HHI*) of concentration, which squares the market shares of each firm in the

Table 15.3

Federal Government Standards for Horizontal Mergers

Value of the Herfindahl-Hirschman Index (HHI) of a Market after a Merger	Amount by Which the Merger Increases the HHI	Antitrust Action by Federal Regulators
Less than 1,500	Increase doesn't matter	Merger will be allowed.
Between 1,500 and 2,500	Fewer than 100 points	Merger is unlikely to be challenged.
Between 1,500 and 2,500	More than 100 points	Merger may be challenged.
Greater than 2,500	Fewer than 100 points	Merger is unlikely to be challenged.
Greater than 2,500	Between 100 and 200 points	Merger may be challenged.
Greater than 2,500	More than 200 points	Merger is likely to be challenged.

industry and adds up the values of the squares. The following are some examples of calculating HHI:

- 1 firm, with 100 percent market share (a monopoly):

$$\text{HHI} = 100^2 = 10{,}000.$$

- 2 firms, each with a 50 percent market share:

$$\text{HHI} = 50^2 + 50^2 = 5{,}000.$$

- 4 firms, with market shares of 30 percent, 30 percent, 20 percent, and 20 percent:

$$\text{HHI} = 30^2 + 30^2 + 20^2 + 20^2 = 2{,}600.$$

- 10 firms, each with a 10 percent market share:

$$\text{HHI} = 10 \times (10)^2 = 1{,}000.$$

Merger Standards Table 15.3 shows how the Department of Justice and the FTC use the HHI calculation for a market to evaluate proposed horizontal mergers according to these standards.

The merger guidelines state that increases in economic efficiency will be taken into account and can lead to approval of a merger that otherwise would be opposed, but the burden of showing that the efficiencies exist lies with the merging firms:

> The merging firms must substantiate efficiency claims so that the [Department of Justice and the FTC] can verify by reasonable means the likelihood and magnitude of each asserted efficiency. . . . Efficiency claims will not be considered if they are vague or speculative or otherwise cannot be verified by reasonable means.

Apply the Concept

Should the Federal Government Take a More Forceful Approach to Antitrust Policy?

During the 2020 presidential campaign, Joe Biden argued that the federal government's approach to antitrust had allowed monopoly power to increase in the economy. A spokesperson for his campaign stated that "growing economic concentration and monopoly power in our nation today threatens our American values of competition, choice, and shared prosperity."

Once in office, Biden's appointees to key antitrust positions favored a more forceful approach to antitrust policy. Lina Khan, Biden's pick for Federal Trade Commission (FTC) chair, argued that large technology firms such as Amazon, Facebook, and Google may have violated antitrust laws. Traditionally, antitrust policy has focused on consumer well-being and would permit a merger that increases monopoly power while at the same time improving economic efficiency—if the net effect of the merger is to increase consumer surplus. Khan and some other Biden appointees favor a different approach to antitrust, similar to that of Louis Brandeis, who served on the U.S. Supreme Court from 1916 to 1939.

Brandeis was not familiar with economics, and his views on antitrust as stated in his articles and court decisions can be contradictory. The late Robert Bork, who taught at Yale Law School and served as a federal appeals court judge, provided an influential interpretation of Brandeis's views in his book *The Antitrust Paradox*. According to Bork, in the early twentieth century, "the dominant goal [of antitrust policy] was the protection of consumer welfare, though Justice Louis Brandeis . . . was the first to give operative weight to the conflicting goal of small-business welfare." Bork argued that an implication of Brandeis's views was that antitrust enforcement might end up "protecting the inefficient [firms] from competition." Similarly, Daniel Crane of the University of Michigan has referred to the "'Brandeisian' tradition, associated with US Supreme Court Justice Louis Brandeis, [which] is often described as . . . supporting atomistic competition because of its beneficial effects on personal liberty and autonomy."

Graeme Sloan/Sipa USA/Alamy Stock Photo

Lina Khan argued that large technology firms such as Amazon, Facebook, and Google have violated the antitrust laws.

John Cassidy, an economics writer for the *New Yorker*, summarized the position of modern-day supporters of Brandeis's approach:

> Proponents of the New Brandeis-ism contend that these [antitrust] agencies should act proactively—carrying out broad investigations, publishing reports, and establishing rules of conduct for companies with a great deal of market power, including tech platforms and broadband providers.

In July 2021, President Biden issued an executive order creating a White House Competition Council. According to a statement from the White House, the purpose of the council is "to coordinate the federal government's response to the rising power of large corporations in the economy." Also in July 2021, the FTC, under Khan's leadership, voted to move away from the consumer welfare standard for judging business strategies, including merging or acquiring other firms and certain pricing decisions, such as cutting prices to below those charged by smaller rivals. The FTC will now take action against business strategies even if they are not directly in violation of the federal antitrust laws. The FTC is particularly concerned about strategies used over the years by large technology firms such as Facebook (owned by Meta Platforms), Google (owned by Alphabet), Amazon, and Apple.

For instance, in 2022, the FTC pursued an antitrust lawsuit against Meta to force the firm to sell off the WhatsApp messaging app and the Instagram photo and video sharing app. And in September 2023, in its most significant attempt to implement the new approach to antitrust policy, the FTC sued Amazon for, in the words of Khan, "exploiting its monopoly power to enrich itself."

The Biden administration's redirection of antitrust policy has run into criticism. An article in the *Wall Street Journal* quoted the president of the Consumer Technology Association as stating that "the consumer-welfare standard grounds competition policy in objective facts and evidence. By protecting consumers rather than competitors, we ensure antitrust decisions are not subjective or political." The "consumer-welfare standard" is the standard that had been used under previous presidential administrations, as we noted earlier. A possible barrier to the Biden administration's change in policy is that ultimately it is up to the federal courts to decide the legality of a business strategy. In recent decades, the federal courts have consistently required that for a strategy to be declared illegal, it must violate antitrust laws.

As of late 2023, it was unclear whether the federal courts would support the FTC's new approach. For instance, the FTC filed suit to stop Meta from buying virtual reality firm Within Unlimited. But after a federal court judge wouldn't issue a court order stopping the merger, the FTC stopped trying to block it. We'll need to observe future federal court decisions either upholding or dismissing actions of the FTC or the Department of Justice based on the new standards before we can know whether the Biden administration's antitrust policy will result in different outcomes than the policies of previous administrations.

Your Turn: Test your understanding by doing related problems 6.5, 6.6, and 6.7 at the end of this chapter.

Regulating Natural Monopolies

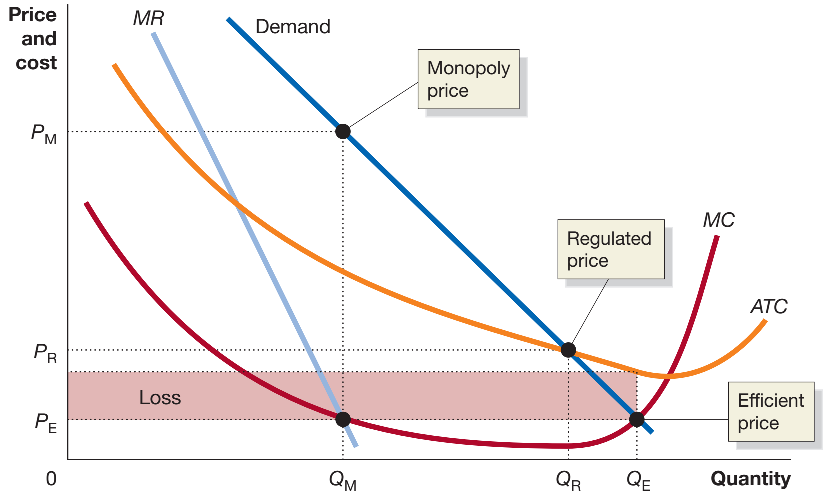
If a firm is a natural monopoly, competition from other firms will not play its usual role of forcing price down to the level where the firm earns zero economic profit in the long run. As a result, local or state *regulatory commissions* usually set the prices for natural monopolies, such as firms selling natural gas or electricity. What price should these commissions set? Economic efficiency requires the last unit of a good or service produced to provide an additional benefit to consumers equal to the additional cost of producing it (see Chapter 12, Section 12.6). We can measure the additional benefit consumers receive from the last unit by the price of the product, and we can measure the additional cost to the monopoly of producing the last unit by marginal cost. Therefore, to achieve economic efficiency, regulators should require that the monopoly charge a price equal to its marginal cost. There is, however, an important drawback to doing so, as illustrated in Figure 15.8, which shows the situation of a typical regulated natural monopoly.

Remember that with a natural monopoly, the average total cost curve is still falling when it crosses the demand curve. If unregulated, the monopoly will charge a price equal to P_M and produce Q_M. To achieve economic efficiency, regulators should require the monopoly to charge a price equal to P_E. The monopoly will then produce Q_E. But here is the drawback: P_E is less than average total cost, so the monopoly will be suffering a loss, shown by the area of the red-shaded rectangle. In the long run, the owners of the monopoly will not continue in business if they are experiencing a loss. Realizing this, most regulators will set the regulated price, P_R, equal to the level of average total cost at which the demand curve intersects the *ATC* curve. At that price, the owners of the monopoly are able to break even on their investment by producing the quantity Q_R, although this quantity is below the efficient quantity, Q_E.

Figure 15.8

Regulating a Natural Monopoly

A natural monopoly that is not subject to government regulation will charge a price equal to P_M and produce Q_M. If government regulators want to achieve economic efficiency, they will set the regulated price equal to P_E, and the monopoly will produce Q_E. But P_E is below average total cost, and the monopoly will suffer a loss, shown by the red rectangle. Because the monopoly will not continue to produce in the long run if it suffers a loss, government regulators set a price equal to average total cost, which is P_R in the figure. The resulting production, Q_R, will be below the efficient level.



Continued from chapter opener

Economics in Your Life & Career

Can a Business Run from Your Dorm Be a Monopoly?

At the beginning of the chapter, we asked whether the submarine sandwich business you and your roommate, Fatma, start in your dorm is a monopoly and whether you should charge high prices for the subs to increase your profit.

In this chapter, we have seen that a monopoly is a firm that is the only seller of a good or service that does not have a close substitute. Even though you and Fatma would be the only sellers of subs on campus during the evening hours on Saturdays and Sundays, there could be other options for hungry students. For example, students could buy food from nearby off-campus restaurants, have food delivered from those restaurants, or buy from on-campus vendors that are open earlier in the day. Most goods have substitutes, and you and Fatma should realize that for many students, pizza and hamburgers from local restaurants are good substitutes for subs. High prices are likely to lead many of your customers to search for those substitutes.

Conclusion

The more intense the competition among firms, the better a market works. If a market is a monopoly, then, compared with the situation in which the market is perfectly competitive, the price of the good or service is higher, output is lower, and consumer surplus and economic efficiency are reduced. Fortunately, true monopolies are rare. Even though most firms resemble monopolies in being able to charge a price above marginal cost, most markets have enough competition to keep the efficiency losses from market power low.

CHAPTER SUMMARY AND PROBLEMS

Key Terms

Antitrust laws, p. 539
Collusion, p. 539
Copyright, p. 520
Horizontal merger, p. 539
Market power, p. 530
Monopoly, p. 516
Natural monopoly, p. 521
Network externality, p. 520
Patent, p. 518
Price discrimination, p. 531
Public franchise, p. 520
Vertical merger, p. 539

15.1 Is Any Firm Ever Really a Monopoly?

LEARNING OBJECTIVE: Define monopoly.

Summary

A **monopoly** exists only in the rare situation in which a firm is producing a good or service for which there are no close substitutes. A narrow definition of monopoly that some economists use is that a firm has a monopoly if it can ignore the actions of all other firms. Many economists favor this broader definition of monopoly: A firm has a monopoly if no other firms are selling a substitute close enough that the firm's economic profit is competed away in the long run.

Review Questions

1.1 What is a monopoly? Can a firm be a monopoly if close substitutes for its product exist?

1.2 If you own the only hardware store in a small town, do you have a monopoly?

Problems and Applications

1.3 The great Detroit Tigers baseball player Ty Cobb had a reputation for being very thrifty. Near the end of his life, he was interviewed by a reporter who was surprised to find that Cobb used candles, rather than electricity, to light his home. From Ty Cobb's point of view, was the local electric company a monopoly?

1.4 [Related to the Economics in Your Life & Career] According to an article in the *New York Times*, "in many parts of the country, there are no [independent bookstores]: Barnes & Noble is the only bookstore in town." Should the only bookstore in a town be considered a monopoly? If so, why wouldn't another entrepreneur open another bookstore in that town?

1.5 Harvard Business School started using case studies—descriptions of strategic problems encountered at real companies—in courses in 1912. Today, Harvard Business Publishing (HBP) sells its case studies to about 4,000 colleges worldwide. HBP is the sole publisher of Harvard Business School's case studies. What criteria would you use to determine whether HBP has a monopoly on the sale of business case studies to be used in college courses?

1.6 [Related to the Apply the Concept "Has the USPS Outlived Its Usefulness?"] A task force established by the Trump administration to evaluate the USPS recommended that Congress consider making the USPS a private firm, although the Postal Regulatory Commission might keep the authority to regulate the prices the new firm would charge. The administration noted that the "USPS is caught between a mandate to operate like a business but with the expenses and the political oversight of a public agency."

a. Suppose that Congress allowed the USPS to retain its monopoly on deliveries to residential mailboxes but also allowed it to operate as a private business without needing to have its prices approved by the Postal Regulatory Commission and without having to meet the universal service obligation that Congress requires of it. What changes might the USPS make in how it operates?

b. Who might gain and who might lose if Congress ended the USPS's monopoly on deliveries to residential mailboxes and made the USPS a private firm, entirely free from government regulation?

15.2 Where Do Monopolies Come From?

LEARNING OBJECTIVE: Explain the four main reasons monopolies arise.

Summary

To have a monopoly, barriers to entering the market must be so high that no other firms can enter. Barriers to entry may be high enough to keep out competing firms for four main reasons: (1) A government blocks the entry of more than one firm into a market by issuing a **patent**, which is the exclusive right to make a product for 20 years, a **copyright**, which is the exclusive right to produce and sell a creation, or a *trademark*, which grants a firm legal protection against other firms using its product's name, or by giving a firm a **public franchise**, which is the right to be the only legal provider of a good or service; (2) one firm has control of a key raw material necessary to produce a good; (3) there are important *network externalities* in supplying the good or service; or (4) economies of scale are so large that one firm has a *natural monopoly*. A **network externality** refers to a situation in which the usefulness of a product increases with the number of consumers who use it. A **natural monopoly** is a situation in which economies of scale are so large that one firm can supply the entire market at a lower average cost than can two or more firms.

Review Questions

2.1 What are the four most important ways a firm becomes a monopoly?

2.2 If patents, copyrights, and trademarks reduce competition, why does the federal government grant them?

2.3 What is a public franchise? Are all public franchises natural monopolies?

2.4 What is "natural" about a natural monopoly?

Problems and Applications

2.5 In 2023, Chipotle Mexican Grill filed a lawsuit against sweetgreen in response to the salad restaurant chain introducing a new menu item called the Chipotle Chicken Burrito Bowl. Chipotle claimed that sweetgreen's new item infringed on the trademark Chipotle has on the firm's name. According to an article in the *Wall Street Journal*, Chipotle wanted the court to order sweetgreen to stop "selling the chipotle bowls and order the salad seller to pay it any profit it made from the new item, plus damages and lawyer fees." Chipotle withdrew the lawsuit after sweetgreen agreed to change the name of the item to Chicken + Chipotle Pepper Bowl. Note that Chipotle could not trademark the word "chipotle" because it is the name of a smoke-dried ripe jalapeño pepper, so anyone can use the name in that sense. Why would Chipotle care about the name sweetgreen had originally given to its new menu item? What was Chipotle afraid might happen if many restaurants began using similar names for new menu items?

2.6 For most of the 1800s, the United States did not recognize the copyrights of books written by foreign authors. As a result, many U.S. publishers printed "pirated"—unauthorized—editions of works by Charles Dickens and other British authors without paying them royalties. A history of book publishing noted, "[U.S.] publishers claimed that pirating [foreign] works allowed their prices to remain low, which in turn made the works more accessible to the public at large." There were (eventually successful) attempts in Congress to recognize foreign copyrights in exchange for other countries recognizing U.S. copyrights. At the time, one U.S. publisher described these efforts as the "clamor of two hundred authors against the interests of fifty-five million people." Do copyright laws benefit authors at the expense of readers? If so, why does the U.S. Constitution give Congress the right to enact copyright laws?

2.7 An article in the *Wall Street Journal* discussed the popularity of iPhones among people aged 18 to 24. The article quoted one college student as saying:

> I've had people with Androids apologize that they have Androids and don't have iMessage. I don't know if it's Apple propaganda or just like a tribal in-group versus out-group thing going on, but people don't seem to like green text bubbles that much and seem to have this visceral negative reaction to it.

The article noted that "many of the new iMessage features—such as the 3D-like digital avatars known as memojis— . . . don't make money for Apple directly." Why would Apple spend money improving iMessage if doing so doesn't make money for Apple directly? Do the improvements make money for Apple indirectly? Briefly explain.

2.8 An article in the *Wall Street Journal* discussing the smartphone market notes that industry analysts have observed that Apple's "biggest advantage has been its role as the only seller of devices featuring its iOS operating system. The iOS monopoly means users who switch to a rival device would have to learn a new system and potentially give up some stored information." Does Apple have a monopoly on smartphones? Why are the analysts quoted in the article using "monopoly" in this context?

2.9 **[Related to the Apply the Concept "Does Hasbro Have a Monopoly on Monopoly?"]** Why should it matter legally whether Professor Anspach was correct that Hasbro's Monopoly game closely resembles a game that had been played for decades before Charles Darrow claimed to have invented it? Does it matter economically? Briefly explain.

2.10 An opinion column in the *Wall Street Journal* was titled "How Much Longer Can Baseball's 100-Year Monopoly Last?" Major League Baseball (MLB) comprises 30 teams located in large cities across the United States (one team, the Toronto Blue Jays, is located in Canada). Each team plays in a stadium that seats 35,000 or more fans. In what sense might MLB be considered a monopoly? Why might it be difficult for new leagues to enter the market for professional baseball in the United States?

2.11 A column on bloomberg.com argues that natural gas pipelines "are a natural monopoly. Almost all of the costs are the fixed ones involved in building them; as long as there's spare capacity, the incremental expense of moving an extra cubic meter of gas down the line is infinitesimal." Briefly explain why the cost structure of pipelines as the columnist describes it makes pipelines a natural monopoly. Be sure to define *natural monopoly* in your answer.

2.12 Suppose that the quantity demanded per day for a product is 90 when the price is $35. The following table shows costs for a firm with a monopoly in this market:

Quantity (per day)	Total Cost
30	$1,200
40	1,400
50	2,250
60	3,000

Briefly explain whether this firm has a natural monopoly.

15.3 How Does a Monopoly Choose Price and Output?

LEARNING OBJECTIVE: Explain how a monopoly chooses price and output.

Summary

Monopolists face downward-sloping demand and marginal revenue curves and, like all other firms, maximize profit by producing where marginal revenue equals marginal cost. Unlike a perfect competitor, a monopolist that earns an economic profit does not face the entry of new firms into the market. Therefore, a monopolist can earn an economic profit even in the long run.

Review Questions

3.1 What is the relationship between a monopolist's demand curve and the market demand curve? What is the relationship between a monopolist's demand curve and its marginal revenue curve?

3.2 In what sense is a monopolist a *price maker*? Will charging the highest possible price always maximize a monopolist's profit? Briefly explain.

3.3 Draw a graph that shows a monopolist earning a profit. Be sure your graph includes the monopolist's demand, marginal revenue, average total cost, and marginal cost curves. Be sure to indicate the profit-maximizing level of output and price.

Problems and Applications

3.4 **[Related to Solved Problem 15.3]** Ed Scahill has acquired a monopoly on the production of baseballs (don't ask how) and faces the demand and cost situation shown in the following table.

Price	Quantity (per week)	Total Revenue	Marginal Revenue	Total Cost	Marginal Cost
$20	15,000			$330,000	
19	20,000			365,000	
18	25,000			405,000	
17	30,000			450,000	
16	35,000			500,000	
15	40,000			555,000	

- **a.** Fill in the remaining values in the table.
- **b.** If Ed wants to maximize profit, what price should he charge, and how many baseballs should he sell? How much profit (or loss) will he make? Draw a graph to illustrate your answer. Your graph should be clearly labeled and should include Ed's demand, *ATC*, *AVC*, *MC*, and *MR* curves; the price he is charging; the quantity he is producing; and the area representing his profit (or loss).
- **c.** Suppose the government imposes a tax of $50,000 per week on baseball production. Now what price should Ed charge, how many baseballs should he sell, and what will his profit (or loss) be?
- **d.** Suppose that the government raises the tax in part (c) to $70,000. Now what price should Ed charge, how many baseballs should he sell, and what will his profit (or loss) be? Will his decision on what price to charge and how much to produce be different in the short run than in the long run? Briefly explain.

3.5 **[Related to Solved Problem 15.3]** Use the information in Solved Problem 15.3 to answer the following questions.

- **a.** What will Comcast do if the tax is $36 per month instead of $25? (*Hint:* Will its decision be different in the long run than in the short run?)
- **b.** Suppose that the flat per-month tax is replaced with a tax on the firm of $25 per cable subscriber. Now how many subscriptions should Comcast sell if it wants to maximize profit? What price should it charge? What is its profit? (Assume that Comcast will sell only the quantities listed in the table.)

3.6 **[Related to the Don't Let This Happen to You "Don't Assume That Charging a Higher Price Is Always More Profitable for a Monopolist"]** A student argues: "If a monopolist finds a way of producing a good at lower cost, he will not lower his price. Because he is a monopolist, he will keep the price and the quantity the same and just increase his profit." Do you agree? Use a graph to illustrate your answer.

3.7 Does a monopolist have a supply curve? Briefly explain. (*Hint:* Look again at the definition of a supply curve in Chapter 3, Section 3.2 and consider whether this definition applies to a monopolist.)

3.8 **[Related to the Apply the Concept "A Monopoly on a Product Nobody Wants? The Cases of Washboards and Slide Rules"]** When introduced in the late 1970s, the videocassette recorder, or VCR, was the first technology that allowed consumers to play recorded movies on their televisions. VCRs eventually declined in popularity, following the introduction of DVD and Blu-ray players and after most people had internet connections that allowed them to stream movies. A columnist for the *Wall Street Journal* notes that "the last known manufacturer of [VCRs] ceased production in 2016." Therefore, nothing prevents you from establishing a monopoly in the VCR market. Draw a graph showing the situation your VCR firm would be in. Be sure to include on your graph your demand, marginal revenue, average total cost, and marginal cost curves. Indicate the price you would charge and the quantity you would produce. Are you likely to make a profit or a loss? Show this area on your graph.

3.9 Quora.com is a website where people post questions and users suggest answers. One user posted the following question: "If monopolies are price makers, why don't they charge an infinite price?"

- **a.** What does the person posting the question mean by a "price maker"?
- **b.** Provide an answer to this person's question.

3.10 Will a monopoly that maximizes profit also be maximizing revenue? Will it be maximizing output? Briefly explain.

15.4 Does Monopoly Reduce Economic Efficiency?

LEARNING OBJECTIVE: Use a graph to illustrate how a monopoly affects economic efficiency.

Summary

Compared with a perfectly competitive industry, a monopoly charges a higher price and produces a smaller quantity, which reduces consumer surplus and economic efficiency. Some loss of economic efficiency will occur whenever firms have **market power** and can charge a price greater than marginal cost. The total loss of economic efficiency in the U.S. economy due to market power is small, however, because true monopolies are very rare. In most industries, competition will keep price much closer to marginal cost than would be the case in a monopoly.

Review Questions

4.1 The late Nobel Laureate George Stigler wrote that the “purely ‘economic’ case against monopoly is that it reduces aggregate economic welfare. . . . When the monopolist raises prices above the competitive level in order to reap his monopoly profits, customers buy less of the product, less is produced, and society as a whole is worse off.”

- **a.** Draw a graph similar to Figure 15.5. In your graph indicate the price that is at what Stigler refers to as “the competitive level.” Compare this price to the price at which the firm earns “monopoly profits.”
- **b.** Use your graph to explain why society is worse off when a monopolist charges a price that earns monopoly profits than when the price is set at “the competitive level.”

4.2 Explain why market power leads to a deadweight loss. Is the total deadweight loss from market power for the economy large or small?

Problems and Applications

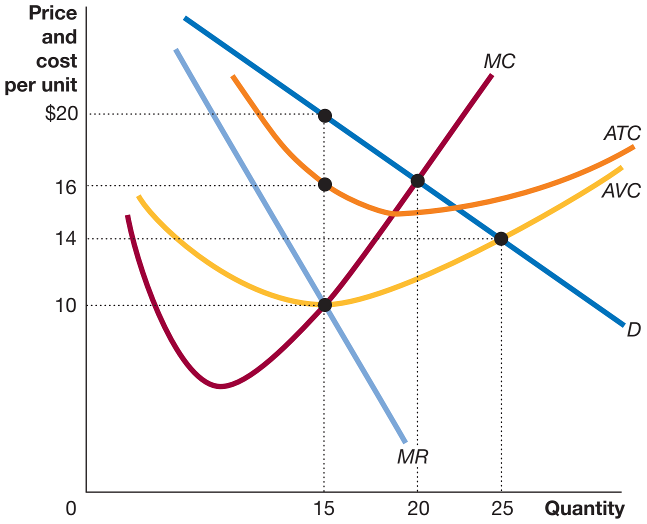
4.3 **[Related to the Chapter Opener]** Suppose that Congress decides to end the USPS’s monopoly on making deliveries to residential mailboxes. Will consumer surplus and economic efficiency necessarily increase? What information would help you to determine the answer?

4.4 The late economist Harvey Leibenstein argued that the loss of economic efficiency in industries that are not perfectly competitive is often understated. He argued that when competition is weak, firms are under less pressure to adopt the best techniques or to hold down their costs. He referred to this effect as “x-inefficiency.” If x-inefficiency causes a firm’s marginal costs to rise, use a graph to show that the deadweight loss in Figure 15.5 understates the true deadweight loss caused by a monopoly.

4.5 Most cities own the water system that provides water to homes and businesses. Some cities charge a flat monthly fee, while other cities charge by the gallon. Which method of pricing is more likely to result in economic efficiency in the water market? Be sure to refer to the definition of *economic efficiency* in your answer. Why do you think the same method of pricing isn’t used by all cities?

4.6 Review the concept of externalities in Chapter 5. If a market is a monopoly, will a negative externality in production always lead to a quantity being produced that is greater than the economically efficient quantity? Use a graph to illustrate your answer.

4.7 Suppose that the city has given Fernando a monopoly selling baseball caps at the local minor league stadium. Use the following graph to answer the questions.



- **a.** What quantity will Fernando produce, and what price will he charge?
- **b.** How much profit will Fernando earn?
- **c.** Review the definition of allocative efficiency in Chapter 12, Section 12.6. If Fernando produced at the allocatively efficient level of output, what quantity would he produce?
- **d.** How much deadweight loss does Fernando create by acting like a monopolist rather than a perfect competitor? (Assume that the marginal cost curve is linear—a straight line—between the two relevant points.)

15.5 Price Discrimination: Charging Different Prices for the Same Product

LEARNING OBJECTIVE: Explain how a firm can increase its profits through price discrimination.

Summary

Price discrimination occurs if a firm charges different prices for the same product when the price differences are not due to differences in cost. Three requirements must be met for a firm to successfully practice price discrimination: (1) A firm must possess market power; (2) some consumers must have a greater willingness to pay for the product than other consumers, and firms must be able to know what consumers are willing to pay; and (3) firms must be able to divide up—or segment—the market for the product so that consumers who buy the product at a low price cannot resell it at a high price. In the case of *perfect price discrimination*, each consumer pays a price equal to his or her willingness to pay.

Review Questions

5.1 What is price discrimination? Under what circumstances can a firm successfully practice price discrimination?

5.2 In 2023, the Philadelphia Museum of Art charged the following admission prices:

Demographic	Admission Price
Adults (19 and over)	$25.00
Seniors (65 and older)	23.00
Youths (18 and under)	Free
College students	14.00
Guest of someone with a museum membership	12.00

Use the admission prices to rank these five groups based on their price elasticities of demand for tickets from highest to lowest.

5.3 What is perfect price discrimination? Is it likely to ever occur? Is perfect price discrimination economically efficient? Briefly explain.

Problems and Applications

5.4 Some people—usually business travelers—have a very strong desire to fly to a particular city on a particular day, and airlines charge these travelers higher ticket prices than they charge other people, such as families who are planning vacations months in advance. Some people really like Big Macs, and some people prefer to eat other food for lunch. Consider the following possible explanations of why airlines can charge different people different prices while McDonald's can't. Briefly explain which explanation is correct.

1. In most cities, there are laws against charging different people different prices for food products.
2. Most people don't pay attention to prices when buying plane tickets, so the airlines can charge different prices without being noticed.
3. People don't like hamburgers as much as they used to, so McDonald's has to keep cutting the prices it charges everyone.
4. People can't resell airline tickets, so people buying them at low prices can't resell them at high prices. People can resell hamburgers more easily.

5.5 In New York City, many people buy their Christmas trees from sidewalk vendors. An article about these vendors in the *New York Times* has the headline "How Much for That Tree? $35 in Harlem, or $135 in SoHo." Harlem is a lower-income neighborhood, and SoHo is a higher-income neighborhood.

- **a.** Are the sidewalk Christmas tree vendors in New York City practicing price discrimination? Briefly explain.
- **b.** The article also notes that the Christmas tree vendors must pay rent to the owners of the buildings that front the sidewalks. According to the article, "The most sought-after spots in high-end neighborhoods have created notorious price wars among vendors plotting to outbid one another. The cutthroat competition has increased rents . . . by as much as 500 percent in eight years." Does this additional information affect your answer to part (a)? Briefly explain.

5.6 While in Shanghai, China, to teach an MBA course, Craig Richardson, an economics professor from Winston-Salem State University, asked his American students to haggle with sellers in a market where prices for the same items can vary widely. Professor Richardson explained that the same item with the same sticker price at different market stalls can have a final price that varies "by 1,500% or more, depending on the negotiating skills of the buyer."

- **a.** Do Shanghai merchants practice price discrimination? Briefly explain.
- **b.** Which consumers are likely to pay the highest prices for similar items in the Shanghai market?

5.7 Economics writer Noah Smith noted in an opinion column that "when prices are posted publicly, as with a price tag at a store, everyone sees what everyone else is paying. . . . But in the age of the internet . . . online, it's only me and my computer." In what ways might it be easier for sellers on the internet to practice price discrimination than for sellers in retail stores to do so?

5.8 According to an article in the *New York Times*, "Amazon raises and lowers product prices millions of times a day using a complex algorithm based on competitors' prices, supply and demand, and shopping habits." The article notes that the frequent price changes make it harder for consumers to tell whether Amazon is charging a higher or lower price than competitors. The article also quotes the developer of an app that helps consumers keep track of their spending budgets as observing that higher-income people are less likely to spend time comparing prices on different sites, but "if your household is quite sensitive to the prices of consumer goods, then on some level you don't have the luxury of losing sight of prices." Can Amazon's frequent changes of the prices of many products be a form of price discrimination? Briefly explain.

5.9 In 2023, the Walt Disney Company offered a complex variety of ticket options for admission to Walt Disney World.

- **a.** Disney charged different prices for 1-day tickets to its Disney World parks, depending on the time of year. Summer and the winter holiday season had the highest ticket prices, while most weeks in the winter and spring had the lowest. But people buying tickets that could be used for more than 1 day paid the same price whatever time of year they attended. Briefly explain what assumptions Disney must be making for this pricing strategy to increase its profit.
- **b.** A Disney World guidebook notes that families have many different ticket options to choose from and that "adding to the complexity, Disney's reservation agents are trained to avoid answering . . . which ticket option is 'best.' Many families, we suspect, become overwhelmed . . . and simply purchase a more expensive ticket with more features than they'll use." Can the complexity of Disney's ticket options be a form of price discrimination? If so, which people are likely to pay the higher ticket prices and which people the lower ticket prices?
- **c.** The same guidebook notes that "Disney uses third-party wholesalers to offer discounted tickets . . . so it doesn't have to offer discounts to the general public." Is this strategy also a form of price discrimination? Briefly explain.

5.10 An article in the *New York Times* notes that when virtual reality headsets were first available, they were "prohibitively expensive" but that prices have declined significantly over the years. Is it possible that Sony, Meta, and the other firms producing virtual reality headsets were better off keeping prices high when initially offering them for sale, even if the result was a smaller quantity sold? Briefly explain.

5.11 **[Related to the Don't Let This Happen to You "Don't Confuse Price Discrimination with Other Types of Discrimination"]** A columnist on forbes.com offered the following advice to retailers practicing price discrimination:

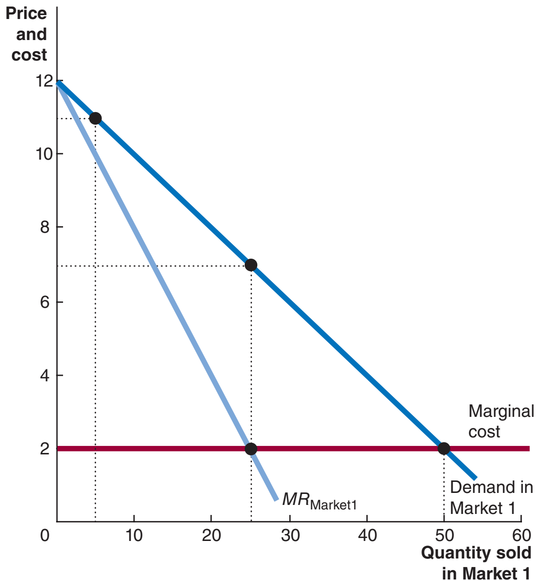
> Consumers don't much like the idea of other people getting better deals than are offered to them, and retailers need to be careful not to turn *differentiated* pricing into *discriminatory* pricing. There has to be a legal and ethical rationale for offering different prices to different customers.

What would be a legally acceptable reason for offering different prices to different customers? What would be a legally unacceptable reason? Are there situations in which price discrimination might be legally acceptable but ethically unacceptable? Briefly explain.

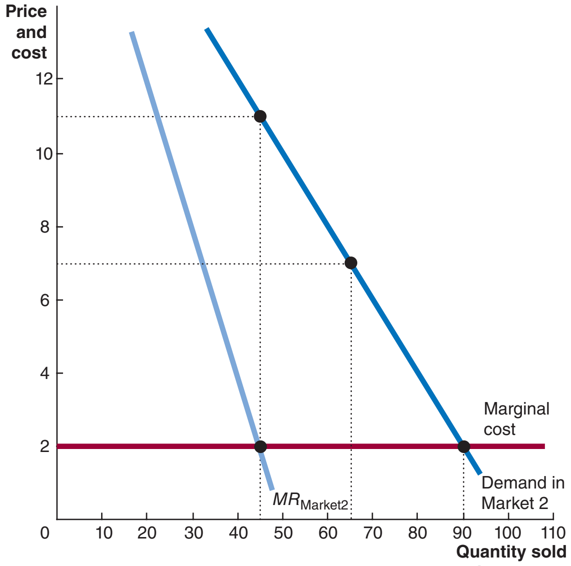
5.12 [Related to Solved Problem 15.5] Use the graphs below of Market 1 and Market 2 to answer the questions about a firm that is selling in both markets.

a. If this firm wants to maximize profit, what price will it charge in Market 1, and what quantity will it sell?

b. If this firm wants to maximize profit, what price will it charge in Market 2, and what quantity will it sell?



(a) Market 1



(b) Market 2

5.13 Jason Furman and Tim Simcoe, who served on President Barack Obama's Council of Economic Advisors, wrote:

> Economists have studied [price discrimination] for many years, and while big data seems poised to revolutionize pricing practice, it has not altered the underlying principles. . . . Those principles suggest that [price discrimination] is often good for both firms and their customers.

Furman and Simcoe described "need-based financial aid for college students" as an example of price discrimination that is good for consumers.

a. What do Furman and Simcoe mean by "underlying principles"?

b. In what sense is need-based financial aid an example of price discrimination?

c. Is financial aid good for both colleges and students? Briefly explain.

5.14 Diego has a monopoly on sales of pizzas in the small town of North Key Largo, Florida. Use the following information on the demand for Diego's pizzas to answer the questions.

Price	Quantity Demanded
$30	0
25	1
20	2
15	3
10	4
5	5
0	6

a. If Diego can produce pizzas at a constant cost of $5 per pizza, how many pizzas does he produce, what price does he charge, and how much profit does he make?

b. If Diego is able to engage in perfect price discrimination, what is his total revenue for 3 pizzas? What is his marginal revenue from the third pizza?

c. If Diego is able to engage in perfect price discrimination, how many pizzas does he produce, and how much profit does he make?

d. Draw a graph showing producer surplus, consumer surplus, and deadweight loss if Diego does not practice price discrimination. Draw a second graph showing producer surplus, consumer surplus, and deadweight loss if Diego practices perfect price discrimination.

15.6 Government Policy toward Monopoly

LEARNING OBJECTIVE: Explain how the government regulates monopoly.

Summary

Because monopolies reduce consumer surplus and economic efficiency, governments often regulate them. Firms that are not monopolies have an incentive to avoid competition through **collusion**, or making agreements to charge the same price or otherwise not to compete. In the United States, **antitrust laws** are aimed at deterring monopoly, eliminating collusion, and promoting competition among firms. The Antitrust Division of the U.S. Department of Justice and the Federal Trade Commission share responsibility for enforcing the antitrust laws, including regulating mergers between firms. A **horizontal merger** is a merger between firms in the same industry. A **vertical merger** is a merger between firms at different stages of production of a good. Local governments often regulate the prices charged by natural monopolies.

Review Questions

6.1 What is the purpose of the antitrust laws? Who is in charge of enforcing these laws?

6.2 What is the difference between a horizontal merger and a vertical merger? Which type of merger is more likely to increase the market power of a newly merged firm?

6.3 Why would it be economically efficient to require a natural monopoly to charge a price equal to marginal cost? Why do most regulatory agencies require natural monopolies to charge a price equal to average cost instead?

Problems and Applications

6.4 Microsoft makes the Xbox video console. In 2022, Microsoft announced it was buying Activision Blizzard, which produces video games including *Call of Duty*. The Federal Trade Commission (FTC) sued to stop the purchase. An article in the *Wall Street Journal* quoted Holly Vedova, director of the FTC's bureau of competition, as stating: "Today we seek to stop Microsoft from gaining control over a leading independent game studio and using it to harm competition." Another article in the *Wall Street Journal* noted that "in the typical antitrust case, the government challenges a horizontal merger. . . . The government has struggled to win cases on vertical mergers."

- **a.** What is a vertical merger case? Why would Microsoft buying Activision Blizzard be an example of a vertical merger?
- **b.** Why might it be more difficult under the federal antitrust laws for the FTC to persuade the courts to stop a vertical merger than to persuade the courts to stop a horizontal merger?

6.5 **[Related to the Apply the Concept "Should the Federal Government Take a More Forceful Approach to Antitrust Policy?"]** A proposed merger between the Kroger Company and Albertsons Companies, Inc. would combine the two largest supermarket chains in the United States. Antitrust officials in the Biden administration have argued that "combining big companies can give the merged entities too much power and stifle competition." Proponents of the merger believe that "combining operations could provide greater scale, helping save costs in . . . purchasing, and give the enlarged company more heft when negotiating with vendors."

- **a.** Why do the antitrust officials in President Biden's administration believe that mergers of large companies, such as Kroger and Albertsons, would "stifle competition"? What would be the consequence for consumers if competition in the supermarket industry were "stifled"?
- **b.** If there were a merger between Kroger and Albertsons, how could "greater scale" benefit consumers?

6.6 **[Related to the Apply the Concept "Should the Federal Government Take a More Forceful Approach to Antitrust Policy?"]** A columnist for the *Boston Globe* observes:

> Google is a "monopoly" only in its corner of the internet playing field: search engine advertising. That is certainly an important corner, but it isn't the whole digital universe. It isn't even the whole search universe. . . . For the soaring population of online shoppers, Google is no longer the leading search destination. Amazon is.

- **a.** How do the Department of Justice and the Federal Trade Commission determine the extent of the market a firm competes in?
- **b.** Will this procedure work when applied to Google? Briefly explain.
- **c.** Are there other ways in which the Department of Justice and the Federal Trade Commission can evaluate Google's situation in the context of antitrust laws?

6.7 **[Related to the Apply the Concept "Should the Federal Government Take a More Forceful Approach to Antitrust Policy?"]** In 2023, the Federal Trade Commission (FTC) began investigating Coca-Cola and PepsiCo for possible violation of the Robinson-Patman Act. (We briefly discussed this antitrust act at the end of Section 15.5.) The FTC believed that Coke and Pepsi may have violated the act by offering discounts to large retailers like Walmart and large supermarket chains like Kroger that it didn't offer to smaller stores. A vice president of an organization of small grocery stores wrote a letter to the *Wall Street Journal*, supporting the FTC's revival of the Robinson-Patman Act. He argued that because firms like Coke and Pepsi provide discounts to large retailers, "independent grocers that were once backbones of their communities have been forced to close." Has preserving the number of small businesses typically been an objective of antitrust policy? Is preserving the number of small firms consistent with what's traditionally been the main focus of antitrust policy? Briefly explain.

6.8 We saw in the chapter that when firms want to merge, they frequently make the argument that the newly merged firm will have significantly lower costs. Suppose for the sake of simplicity that all the firms in a perfectly competitive industry want to merge to form a monopoly (though we know that in practice the federal government would never allow such a merger).

- **a.** Draw a graph like Figure 15.5 that shows the results of the merger. Unlike with Figure 15.5, though, assume on your graph that after the merger, the new monopoly firm has marginal costs that are low enough that the price of the product is lower than before the merger. Make sure that your graph shows the price and quantity before and after the merger and the shift in the marginal cost curve.
- **b.** Now show on your graph the consumer surplus and producer surplus before the merger and consumer surplus and producer surplus after the merger.

6.9 Look again at the section "The Department of Justice and FTC Merger Guidelines and the Herfindahl-Hirschman Index of Concentration" and then evaluate the following situations.

- **a.** A market initially has 20 firms, each with a 5 percent market share. Of the firms, 4 propose to merge, leaving a total of 17 firms in the industry. Are the Department of Justice and the Federal Trade Commission likely to oppose the merger? Briefly explain.
- **b.** A market initially has 5 firms, each with a 20 percent market share. Of the firms, 2 propose to merge, leaving a total of 4 firms in the industry. Are the Department of Justice and the Federal Trade Commission likely to oppose the merger? Briefly explain.

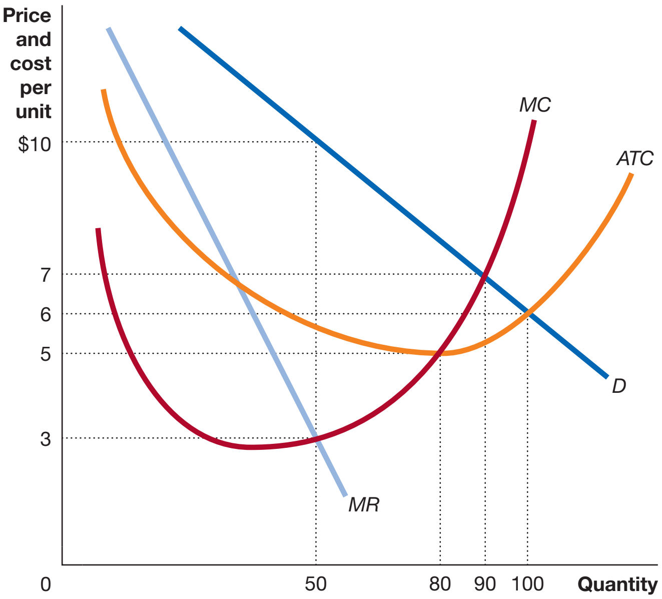
6.10 The following table shows the market shares during the last 3 months of 2022 for companies in the U.S. personal computer (PC) market, which includes desktop PCs and laptops but not tablets, such as iPads.

Company	Market Share
Hewlett-Packard	27%
Dell	23
Apple	17
Lenovo	14
ASUS	6
Acer	4
Others	9

Use the information in the section "The Department of Justice and FTC Merger Guidelines and the Herfindahl-Hirschman Index of Concentration" to predict whether the Department of Justice and the Federal Trade Commission would be likely to oppose a merger between Apple and Dell. Assume that "Others" in the table consists of three firms, each of which has a 3 percent share of the market.

6.11 Consider the natural monopoly shown in Figure 15.8. Assume that the government regulatory agency sets the regulated price, P_R, at the level of average total cost at which the demand curve intersects the *ATC* curve. If the firm knows that it will always be able to charge a price equal to its average total cost, does it have an incentive to reduce its average cost? Briefly explain.

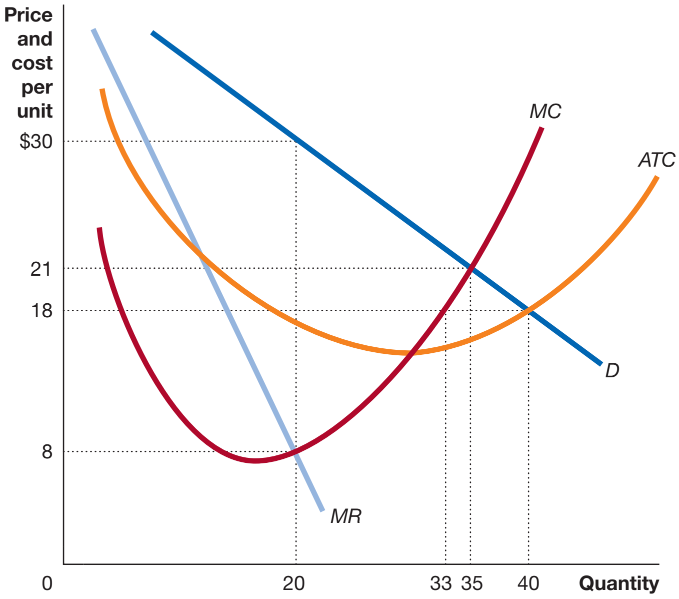
6.12 Use the following graph of a monopoly to answer the questions.



a. What quantity will the monopoly produce, and what price will the monopoly charge?

b. Suppose the monopoly is regulated. If the regulatory agency wants to achieve economic efficiency, what price should it require the monopoly to charge? How much output will the monopoly produce at this price? Will the monopoly make a profit if it charges this price? Briefly explain.

6.13 Use the following graph of a monopoly to answer the questions.



a. What quantity will the monopoly produce, and what price will it charge?

b. Suppose the government decides to regulate this monopoly and imposes a price ceiling of $18. (In other words, the monopoly can charge less than $18 but can't charge more.) Now what quantity will the monopoly produce, and what price will the monopoly charge? Will every consumer who is willing to pay this price be able to buy the product? Briefly explain.

Critical Thinking Exercises

CT15.1 Monopolists are generally very large firms. Does this observation mean that monopolists will always earn a profit? Carefully explain your answer.

CT15.2 In recent chapters, we explored different types of industries that firms may be in, including perfect competition (Chapter 12), monopolistic competition (Chapter 13), and monopoly (this chapter). While they are very different, there is a common method firms use to determine how much of a good or service to produce. What is that method? As part of your answer, include a graph for each type of firm.

CT15.3 The graphs for monopoly and monopolistic competition are quite similar, but the details of each of the graphs are different. Write a paragraph explaining these differences.

16 The Markets for Labor and Other Factors of Production

“The Robots Have Finally Come for My Job”

That’s the title of an opinion column by Greg Ip, chief economics commentator at the *Wall Street Journal*. Ip was referring to the possible effects of ChatGPT on the journalism profession. As we discussed in the opener to Chapter 11, ChatGPT is a *generative artificial intelligence (AI) program* developed by OpenAI, a technology startup headquartered in San Francisco. Because ChatGPT can write sophisticated essays on nearly any subject, Ip observed that “professionals, including people who write columns for a living, now know the fear of obsolescence that has stalked blue-collar workers for generations.”

ChatGPT is just the latest example of businesses substituting capital for labor, a process that has been going on even longer than Ip indicates—at least since the Industrial Revolution of the 1700s, when entrepreneurs in England began using machinery to produce cotton cloth. Technological change has often taken the form of substituting machinery, computers and software, or robots for factory or office workers. For example, in the early 1900s, automobiles were assembled by large numbers of skilled workers. Henry Ford’s introduction of the moving assembly line in 1913 allowed more cars to be produced with fewer workers. Since the 1960s, industrial robots have continued to reduce the number of workers employed building cars.

Many companies have combined advanced robotic technology with sophisticated artificial intelligence software to substitute capital for labor. For example, Amazon Go convenience stores use cameras and sensors to automatically charge customers and eliminate checkout lines and cashiers. Amazon has also been using robots to reduce the number of workers in its warehouses. The company uses software to monitor the productivity of its warehouse workers. Research shows that software does a better job than human managers at identifying the most and least productive workers.

Rio Tinto, a London-based mining company, is on the cutting edge of robotic technology. In the Pilbara region of the Australian Outback, the company uses large robotic drills to dig for iron ore deposits. Employees at computer consoles 800 miles away, in the city of Perth, control the operation of the drills. In its mines, the company uses machines to collect and load ore on 76 driverless trucks that bring the ore to trains for transport to the coast and then shipment abroad. The trucks, which are built in the United States by the Japanese company Komatsu, rely on sensors to safely drive in and around the mines.

Blue Planet Studio/Shutterstock

Software engineers have programed ChatGPT and similar *large language model (LLM)–based chatbots* to produce sophisticated writing. As a result, firms may use chatbot software to replace employees who currently write technical manuals, marketing materials, or newspaper articles; conduct accounting audits; or write computer code. A study by researchers at OpenAI and the University of Pennsylvania estimate that “around 80% of the U.S. workforce could have at least 10% of their work tasks affected by the introduction of LLMs, while approximately 19% of workers may see at least 50% of their tasks impacted.”

Some people argue that the spread of robotic technology and AI software such as chatbots will lead to higher living standards as workers will become more productive if they can rely on technology to perform simple tasks. But other people fear that these technologies will reduce the demand for labor enough to leave some workers permanently unemployed.

Throughout this book, we have used the model of demand and supply to analyze the markets for goods and services. As we will see, this model can also help us analyze important issues concerning the market for labor, including the effect of robots and chatbots.

Chapter Outline & Learning Objectives

16.1 The Demand for Labor, page 556
Explain how firms choose the profit-maximizing quantity of labor to employ.

16.2 The Supply of Labor, page 561
Explain how people choose the quantity of labor to supply.

16.3 Equilibrium in the Labor Market, page 564
Explain how equilibrium wages are determined in labor markets.

16.4 Explaining Differences in Wages, page 569
Use demand and supply analysis to explain how compensating differentials, discrimination, and labor unions cause wages to differ.

16.5 Personnel Economics, page 578
Discuss the role personnel economics can play in helping firms deal with human resources issues.

16.6 The Markets for Capital and Natural Resources, page 581
Show how equilibrium prices are determined in the markets for capital and natural resources.

Economics in Your Life & Career

When Should You Give an Employee a Raise?

Suppose you own a local sandwich shop, and Sophia is one of your employees. She has worked in the shop for a year and asks you for a raise. Sophia has a good attitude and work ethic, and since you hired her, she has learned to make sandwiches more quickly, track inventory more accurately, and work the cash register more effectively. Will you give Sophia a raise? As you read this chapter, try to answer this question. You can check your answer against the one we provide at the end of this chapter.

Factors of production Labor, capital, natural resources, and other inputs used to make goods and services.

Firms use **factors of production**—such as labor, capital, and natural resources—to make goods and services. For example, to produce hamburgers, McDonald's uses:

- **Labor:** Employees who take orders, prepare food, and collect customers' payments
- **Capital:** Hamburger grills and restaurant buildings
- **Natural resources:** Meat, tomatoes, and lettuce

In this chapter, we will explore how firms choose the profit-maximizing quantity of labor and other factors of production. The interaction between firms' demand for labor and households' supply of labor determines the equilibrium wage rate.

Because there are many different types of labor, there are many different labor markets. The equilibrium wage in the market for professional athletes in major sports leagues is much higher than the equilibrium wage in the market for college instructors. We will analyze why. We will also analyze how factors such as discrimination, unions, and compensation for dangerous or unpleasant jobs help explain differences in wages. We will then consider *personnel economics*, which considers how firms can use economic analysis to design their employee compensation plans. Finally, we will analyze the markets for other factors of production.

16.1 The Demand for Labor

LEARNING OBJECTIVE: Explain how firms choose the profit-maximizing quantity of labor to employ.

Derived demand The demand for a factor of production; it depends on the demand for the good the factor produces.

Until this point in the book, we have concentrated on consumer demand for final goods and services. The demand for labor is different from the demand for final goods and services because it is a *derived demand*. A **derived demand** for a factor of production depends on the demand for the good the factor produces. You demand an Apple iPhone because of the utility you receive from making phone calls, texting, using Instagram, playing games, and listening to music. Apple's demand for the labor to make iPhones is derived from the underlying consumer demand for iPhones. As a result, we can say that Apple's demand for labor depends primarily on two factors:

1. The additional iPhones Apple can produce if it hires one more worker
2. The additional revenue Apple receives from selling the additional iPhones

(In fact, Apple's suppliers, rather than Apple itself, manufacture the iPhone. For simplicity, we are assuming here that Apple does the manufacturing.)

The Value of the Marginal Product of Labor

Let's consider an example. To keep the main point clear, we'll assume that in the short run, Apple can increase production of iPhones only by increasing the quantity of labor it employs. The table in Figure 16.1 shows the relationship between the quantity of workers Apple hires, the quantity of iPhones it produces, the additional revenue from selling the additional iPhones, and the additional profit from hiring each additional worker.

For simplicity, we are keeping the scale of Apple's factory very small. We will also assume that Apple is a perfect competitor both in the market for selling smartphones and in the market for hiring labor. As a result, Apple is a *price taker* in both markets. Although this assumption is not realistic, the basic analysis would not change if we assumed that Apple can affect the price of iPhones and the wage paid to workers. Suppose that Apple can sell as many iPhones as it wants at a price of $500 and can hire as many workers as it wants at a wage of $1,000 per week. Remember that the additional output a firm produces as a result of hiring one more worker is called the **marginal product of labor** (see Chapter 11, Section 11.3). In the table in Figure 16.1, we calculate the marginal product of labor as the change in total output as each additional worker is hired. Because of the *law of diminishing returns*, the marginal product of labor declines as a firm hires more workers.

Marginal product of labor The additional output a firm produces as a result of hiring one more worker.

Number of Workers	Output of iPhones per Week	Marginal Product of Labor (iPhones per week)	Product Price	Value of the Marginal Product of Labor (dollars per week)	Wage (dollars per week)	Additional Profit from Hiring One More Worker (dollars per week)
L	*Q*	*MP*	*P*	*VMPL = P x MP*	*W*	*VMPL – W*
0	0	—	$500	—	$1,000	—
1	6	6	500	$3,000	1,000	$2,000
2	11	5	500	2,500	1,000	1,500
3	15	4	500	2,000	1,000	1,000
4	18	3	500	1,500	1,000	500
5	20	2	500	1,000	1,000	0
6	21	1	500	500	1,000	–500

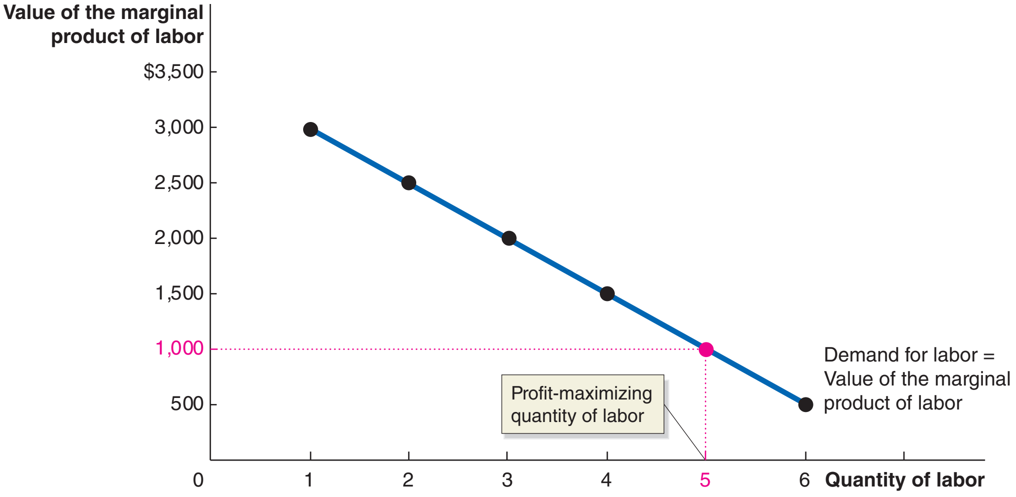


Figure 16.1

The Value of the Marginal Product of Labor and the Demand for Labor

The value of the marginal product of labor equals the marginal product of labor multiplied by the price of the good. The value of the marginal product curve slopes downward because diminishing returns cause the marginal product of labor to decline as the firm hires more workers. A firm maximizes profit by hiring workers up to the point where the wage equals the value of the marginal product of labor. The value of the marginal product of labor curve is the firm's demand curve for labor because it tells the firm the profit-maximizing quantity of workers to hire at each wage. For example, using the demand curve shown in this figure, if the wage is $1,000, the firm will hire 5 workers.

When deciding how many workers to hire, a firm is not interested in how much *output* will increase as it hires another worker but in how much *revenue* will increase as it hires another worker. In other words, what matters is how much the firm's revenue will rise when it sells the additional output it can produce by hiring one more worker. We can calculate this amount, which is called the **value of the marginal product of labor (*VMPL*)**, by multiplying the additional output produced by the product price. For example, consider what happens if Apple increases the number of workers hired from 2 to 3. The table in Figure 16.1 shows that hiring the third worker allows Apple to increase its weekly output of iPhones from 11 to 15, so the marginal product of labor is 4 iPhones. The price of the iPhones is $500, so the value of the marginal product of the third worker is 4 × $500, or $2,000. In other words, Apple adds $2,000 to its revenue as a result of hiring the third worker. In the graph, we plot the value of the marginal product of labor at each quantity of labor.

Value of the marginal product of labor (*VMPL*) The change in a firm's revenue as a result of hiring one more worker.

To decide how many workers to hire, Apple compares the additional revenue it earns from hiring another worker to the increase in its costs from paying that worker. The difference between the additional revenue and the additional cost is the additional profit (or loss) from hiring one more worker. This additional profit is shown in the last column of the table in Figure 16.1 and is calculated by subtracting the wage from the value of the marginal product of labor. As long as the value of the marginal product of labor is greater than the wage, Apple's profit is increasing, and it should continue to hire more workers. When the value of the marginal product of labor is less than the wage, Apple's profit is falling, and it should hire fewer workers. When the value of the marginal product of labor is equal to the wage, Apple has maximized its profit by hiring the optimal number of workers. The values in the table show that Apple should hire 5 workers. If Apple hires a sixth worker, the value of the marginal product of $500 will be less than the wage of

Table 16.1

The Relationship between the Value of the Marginal Product of Labor and the Wage

When . . .	the firm . . .
$VMPL > W$,	should hire more workers to increase profit.
$VMPL < W$,	should hire fewer workers to increase profit.
$VMPL = W$.	is hiring the optimal number of workers and is maximizing profit.

$1,000, and the firm's profit will fall by $500. Table 16.1 summarizes the relationship between the value of the marginal product of labor and the wage.

We can see from Figure 16.1 that if Apple has to pay a wage of $1,000 per week, it should hire 5 workers. If the wage rises to $1,500, then applying the rule that profit is maximized where the value of the marginal product of labor equals the wage, Apple should hire only 4 workers. Similarly, if the wage falls to $500 per week, Apple should hire 6 workers. In fact, the value of the marginal product curve tells a firm how many workers it should hire at any wage rate. In other words, *the value of the marginal product of labor curve is the demand curve for labor.*

Solved Problem 16.1

Hiring Decisions by a Firm That Is a Price Maker

We have assumed that Apple can sell as many iPhones as it wants without having to cut the price. A firm in a perfectly competitive market is in this situation. These firms are *price takers*. Suppose instead that a firm has market power and is a *price maker*, so that to increase sales, it must reduce the price.

Assume that Apple faces the situation shown in the following table. Fill in the missing values and then determine the profit-maximizing quantity of workers for Apple to hire. Briefly explain why hiring this quantity of workers is profit maximizing.

(1) Quantity of Labor	(2) Output of iPhones per Week	(3) Marginal Product of Labor	(4) Product Price	(5) Total Revenue	(6) Value of the Marginal Product of Labor	(7) Wage	(8) Additional Profit from Hiring One Additional Worker
0	0	—	$500		—	$1,000	—
1	6	6	480			1,000	
2	11	5	460			1,000	
3	15	4	440			1,000	
4	18	3	420			1,000	
5	20	2	400			1,000	
6	21	1	380			1,000	

Solving the Problem

Step 1: **Review the chapter material.** This problem is about determining the profit-maximizing quantity of labor for a firm to hire, so you may want to review the section "The Demand for Labor."

Step 2: **Fill in the missing values in the table.** As Apple hires more workers, it sells more iPhones and earns more revenue. You can calculate how revenue increases by multiplying the quantity of iPhones produced—shown in column (2)—by the price—shown in column (4). Then you can calculate the value of the marginal product of labor as the change in revenue as each additional worker is hired. (Notice that in this case, value of the marginal product is *not* calculated by multiplying the marginal product by the product price. Because Apple is a price maker, its marginal revenue from selling additional iPhones is less than the price of iPhones.) Finally, you can calculate the additional profit from hiring one more worker by subtracting the wage—shown in column (7)—from the value of the marginal product of labor.

(1) Quantity of Labor	(2) Output of iPhones per Week	(3) Marginal Product of Labor	(4) Product Price	(5) Total Revenue	(6) Value of the Marginal Product of Labor	(7) Wage	(8) Additional Profit from Hiring One Additional Worker
0	0	—	$500	$0	—	$1,000	—
1	6	6	480	2,880	$2,880	1,000	$1,880
2	11	5	460	5,060	2,180	1,000	1,180
3	15	4	440	6,600	1,540	1,000	540
4	18	3	420	7,560	960	1,000	−40
5	20	2	400	8,000	440	1,000	−560
6	21	1	380	7,980	−20	1,000	−1,020

Step 3: **Use the information in the table to determine the profit-maximizing quantity of workers to hire.** To determine the profit-maximizing quantity of workers to hire, you need to compare the value of the marginal product of labor with the wage. Column (8) makes this comparison by subtracting the wage from the value of the marginal product of labor. As long as the values in column (8) are positive, the firm should continue to hire workers. The value of the marginal product of labor of the third worker is $1,540, and the wage is $1,000, so column (8) shows that hiring the third worker will add $540 to Apple's profit. The value of the marginal product of labor of the fourth worker is $960, and the wage is $1,000, so hiring the fourth worker would reduce Apple's profit by $40. Therefore, Apple will maximize profit by hiring 3 workers.

Your Turn: For more practice, do related problem 1.6 at the end of this chapter.

The Market Demand Curve for Labor

We can determine the market demand curve for labor in the same way we determine the market demand curve for a good—by adding up the quantity of the good demanded by each consumer at each price (see Chapter 10, Section 10.2). To find the market demand curve for labor, we add up the quantity of labor demanded by each firm at each wage, holding constant all other variables that might affect the willingness of firms to hire workers.

Factors That Shift the Market Demand Curve for Labor

In constructing the demand curve for labor, we held constant all variables—except for the wage—that would affect the willingness of firms to demand labor. An increase or a decrease in the wage causes *an increase or a decrease in the quantity of labor demanded*, which we show by a movement along the demand curve. If any variable other than the wage changes, the result is *an increase or a decrease in the demand for labor*, which we show by a shift of the demand curve. The following are the five most important variables that cause the labor demand curve to shift:

1. **Increases in human capital. Human capital** represents the accumulated knowledge and skills that workers acquire from education and training or from their life experiences. For example, a worker with a college education generally has more skills and is more productive than a worker who has only a high school diploma. If workers become more educated and are therefore able to produce more output per day, the demand for their services will increase, shifting the labor demand curve to the right.

Human capital The accumulated knowledge and skills that workers acquire from education and training or from their life experiences.

2. **Changes in technology.** As new and better machinery, equipment, and software are developed, workers who use them become more productive. This effect causes the labor demand curve to shift to the right over time. (We are assuming here that the better machinery or equipment doesn't have the effect of replacing workers with machines. We discuss this point further in Section 16.4.)

3. **Changes in the price of the product.** The value of the marginal product of labor depends on the price a firm receives for its output. A higher price increases the value of the marginal product of labor and shifts the labor demand curve to the right. A lower price shifts the labor demand curve to the left.
4. **Changes in the quantity of other inputs.** Workers are able to produce more if they have more machinery and other inputs available to them. The marginal product of labor in the United States is higher than the marginal product of labor in most other countries in large part because U.S. firms provide workers with more machinery, equipment, and software. Over time, workers in the United States have had increasing amounts of other inputs available to them, which has increased their productivity and caused the labor demand curve to shift to the right.
5. **Changes in the number of firms in the market.** If new firms enter the market, the labor demand curve will shift to the right. If firms exit the market, the labor demand curve will shift to the left. The result is similar to the effect that increasing or decreasing the number of consumers in a market has on the demand for a good.

Apply the Concept

What Is the Economic Payoff for Free Community College?

As people complete more years of education, their earnings tend to rise and their unemployment rates tend to fall. For example, people with a college degree earn significantly more and have lower unemployment rates than do people with only a high school degree. As the following table shows, in March 2023, people aged 25 and over with a bachelor's degree or higher (such as a master's degree or a medical or law degree) earned the most, with average weekly earnings of $1,621, and had the lowest unemployment rate, at 2.0 percent. The table also shows that people who had not earned a high school diploma had weekly earnings of $682 and an unemployment rate of 4.8 percent. People with some college credits or an associate's degree and people who had earned a high school diploma but had not attended college were in between the other two groups.

Educational Attainment	Median Usual Weekly Earnings	Unemployment Rate
Bachelor's degree and higher	$1,621	2.0%
Some college or associate's degree	995	3.0
High school diploma, no college	884	4.0
Less than a high school diploma	682	4.8
Average for all education levels	**$1,155**	**2.9%**

Not surprisingly, attempts to reduce income inequality have often included plans to increase the number of people who attend college. In 2021, President Joe Biden proposed a plan that would cover the tuition of most first-time students attending community college in states that agreed to participate in the plan. As many as 5.5 million students would have been eligible for the plan. In 2022, in the face of opposition from Congress, the Biden administration dropped the plan, but similar plans have been proposed, making the economic payoff for free community college an important policy issue.

We can briefly look at a few of the many economic studies of community colleges. Hieu Nguyen of Illinois Wesleyan University studied the effects of the Tennessee Promise program. Since the fall of 2015, this program has covered the part of tuition not covered by other programs for any Tennessee high school graduate who enrolls in a public two-year college in the state. Nguyen's analysis found that the program had a very large effect, increasing "full-time first-time undergraduate enrollment at the state's community colleges by at least 40%." Some policymakers and economists are concerned that promise programs may divert some students into attending community college who would otherwise have enrolled in a four-year college. But Nguyen's analysis found that the Tennessee Promise program resulted in only a 2 percent decline in enrollment in Tennessee's public four-year colleges.

Oded Gurantz of the University of Missouri studied the Oregon Promise program, which is similar to the Tennessee Promise program. Gurantz found that although the program increased enrollment in two-year colleges by 4 to 5 percent, nearly all of the initial increase was a result of students shifting away from four-year colleges. He found that in later years, the program was effective in increasing enrollment in both two- and four-year colleges.

Elizabeth Bell of Miami University studied a narrowly focused Oklahoma program that covers tuition and fees at a single two-year college—Tulsa Community College. Bell found that the program succeeded in substantially increasing the number of students transferring to four-year colleges and, to a lesser extent, increasing the fraction of students receiving degrees from four-year colleges.

Several researchers have studied the returns to individuals from attending community college. As with the returns from attending four-year colleges, choice of major can be very important. Michael Grosz of the Federal Trade Commission found that, for example, after controlling statistically for the individual characteristics of students, receiving a degree in nursing from a California community college "increases earnings by 44 percent and the probability of working in the health care industry by 19 percentage points."

Jack Mountjoy of the University of Chicago used data from Texas to analyze the effects of community college on students' future earnings. He found that future earnings of students who attended a community college increased if the students would otherwise not have attended college—but not if they attend a community college rather a four-year college they were qualified to attend. Mountjoy noted that survey evidence indicates that 81 percent of students enrolling in two-year colleges intend to ultimately receive a degree from a four-year college, but only 33 percent transfer to a four-year college within six years, and only 14 percent ultimately earn a bachelor's degree.

Mountjoy's results reinforce a point made by some other economists and policymakers: Programs that provide free community college for all students may be a less effective way for governments to spend scarce funds than are programs that focus on boosting the ability of students with low incomes to attend and complete both two-year and four-year colleges. Many low-income students face barriers beyond difficulty affording tuition, including lost earnings from time spent in class or studying rather than working, childcare expenses, and the costs of textbooks and other learning materials. In addition, providing free tuition at community colleges to all students may end up subsidizing college attendance for some middle- and high-income students who would have attended college without the subsidy and may provide an incentive for some students to enroll in two-year colleges when they would have been better off enrolling in four-year colleges.

Your Turn: Test your understanding by doing related problem 1.8 at the end of this chapter.

16.2 The Supply of Labor

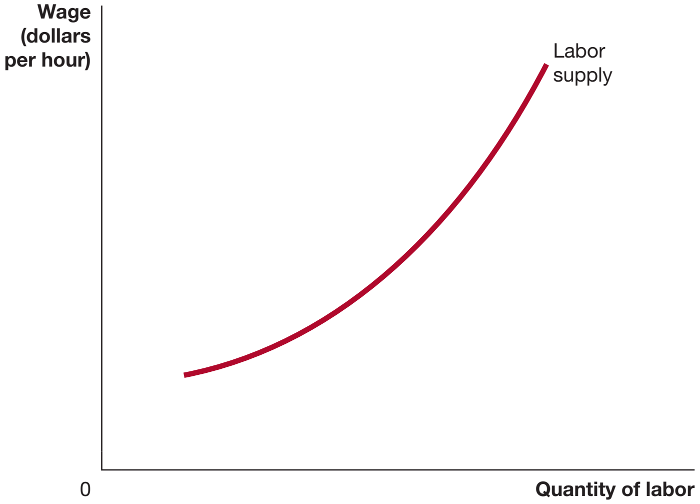
LEARNING OBJECTIVE: Explain how people choose the quantity of labor to supply.

Having discussed the demand for labor, we now consider the supply of labor. Of the many trade-offs people face in life, one of the most important is how to divide up the 24 hours in a day between labor and leisure. Every hour spent posting to Instagram, walking in a park, or engaging in other forms of leisure is one hour less spent working. Because in devoting an hour to leisure we give up an hour's earnings from working, the *opportunity cost* of leisure is the wage. The higher the wage we could earn working, the higher the opportunity cost of leisure. Therefore, as the wage increases, we tend to take less leisure and work more. As Figure 16.2 shows, the result is that the labor supply curve for most people is upward sloping.

Figure 16.2

The Labor Supply Curve

As the wage increases, the opportunity cost of leisure increases, causing individuals to supply a greater quantity of labor. Therefore, the labor supply curve is upward sloping.



Although we normally expect the labor supply curve for an individual to be upward sloping, it is possible that at very high wage levels, the labor supply curve for an individual might be *backward bending*, so that higher wages actually result in a *smaller* quantity of labor supplied, as shown in Figure 16.3. To understand why, recall the definitions of the *substitution effect* and the *income effect* (see Chapter 3, Section 3.1 and Chapter 10, Section 10.1). The substitution effect of a price change refers to the fact that an increase in price makes a good more expensive *relative* to other goods. In the case of a wage change, the substitution effect refers to the fact that an increase in the wage raises the opportunity cost of leisure and causes a worker to devote *more* time to working and less time to leisure.

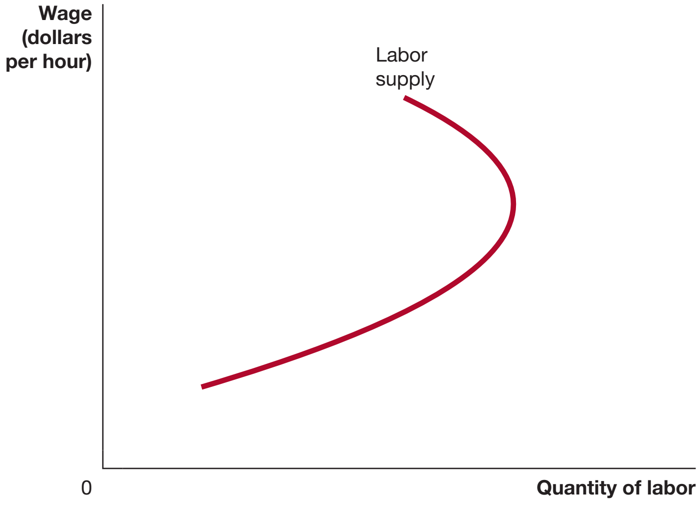
The income effect of a price change refers to the change in the quantity demanded of a good that results from changes in consumer purchasing power as the price changes. An increase in the wage will clearly increase a consumer's purchasing power for any given number of hours worked. For a normal good, the income effect leads to a larger quantity demanded. Because leisure is a normal good, the income effect of a wage increase will cause a worker to devote *less* time to working and more time to leisure. So, the substitution effect of a wage increase causes a worker to supply a larger quantity of labor, but the income effect causes a worker to supply a smaller quantity of labor. Whether a worker supplies more or less labor following a wage increase depends on whether the substitution effect is larger than the income effect.

Figure 16.3 shows the common case of the substitution effect being larger than the income effect at low levels of wages—so the worker supplies a larger quantity of labor as the wage rises—and the income effect being larger than the substitution effect at high

Figure 16.3

A Backward-Bending Labor Supply Curve

As the wage rises, a greater quantity of labor is usually supplied. As the wage rises above a certain level, the individual is able to afford more leisure even though the opportunity cost of leisure is higher. The result may be that an increase in the wage leads to a smaller quantity of labor supplied.



levels of wages—so the worker supplies a smaller quantity of labor as the wage rises. For example, suppose an attorney has become quite successful and can charge clients very high fees. Or suppose a rock band has become very popular and receives a large payment for every concert. In these cases, there is a high opportunity cost for the lawyer to turn down another client to take a longer vacation or for the band to turn down another concert. But because their incomes are already very high, they may decide to give up additional income for more leisure. In this case, for the lawyer or the rock band, the income effect is larger than the substitution effect, and a higher wage causes them to supply *less* labor. Most workers are on the upward-sloping portion of their labor supply curves because, for them, the substitution effect is greater than the income effect.

The Market Supply Curve of Labor

We can determine the market supply curve of labor in the same way we determine the market supply curve of a good. We find the market supply curve of a good by adding up the quantity of the good supplied by each firm at each price (see Chapter 12, Section 12.4). Similarly, we find the market supply curve of labor by adding up the quantity of labor supplied by each worker at each wage, holding constant all other variables that might affect the willingness of workers to supply labor.

Factors That Shift the Market Supply Curve of Labor

In constructing the market supply curve of labor, we hold constant all other variables that would affect the willingness of workers to supply labor, except the wage. If any of these other variables change, the market supply curve will shift. Three variables are the most important factors that cause the market supply curve of labor to shift:

1. **Increasing population.** As the population grows due to the number of births exceeding the number of deaths and due to immigration, the supply curve of labor shifts to the right. The effects of immigration on labor supply are discussed further in Section 16.3.

2. **Changing demographics.** *Demographics* refers to the composition of the population. The more people who are between the ages of 16 and 65, the greater the quantity of labor supplied. During the 1970s and 1980s, the U.S. labor force grew particularly rapidly as members of the baby boom generation—born between 1946 and 1964—first began working. In contrast, low birth rates in Japan, Russia, and China have resulted in rapidly aging populations. The number of working-age people in Japan actually began to decline beginning in 2002, as did the working-age population of Russia in 2009 and of China in 2014. Holding other factors constant, a declining working-age population will cause the labor supply curve to shift to the left.

   A related demographic issue is the changing role of women in the labor force. In 1900, only 21 percent of women in the United States were in the labor force. By 1950, this figure had risen to 30 percent, and by 2023 it was 57 percent. This increase in the *labor force participation* of women has significantly increased the supply of labor in the United States.

3. **Changing alternatives.** The labor supply in any particular labor market depends, in part, on the opportunities available in other labor markets. For example, declining sales at department stores such as Macy's and J.C. Penney have led to layoffs at those firms. Many workers have left the market for labor at brick-and-mortar retail stores—causing the labor supply curve to shift to the left—and entered other markets, causing the labor supply curves to shift to the right in those markets. People who have lost jobs or who have low incomes are eligible for unemployment insurance and other payments from the government. The more generous these payments are, the less pressure unemployed workers have to quickly find another job. In many European countries, it is much easier than in the United States for unemployed workers to replace a larger fraction of their wage income with government payments. Many economists believe generous unemployment benefits help explain the higher unemployment rates experienced in some European countries.

16.3 Equilibrium in the Labor Market

LEARNING OBJECTIVE: Explain how equilibrium wages are determined in labor markets.

In Figure 16.4, we bring together labor demand and labor supply to determine equilibrium in the labor market. We can use demand and supply to analyze changes in the equilibrium wage and the level of employment for the entire labor market, and we can also use demand and supply to analyze markets for different types of labor, such as baseball players or college instructors.

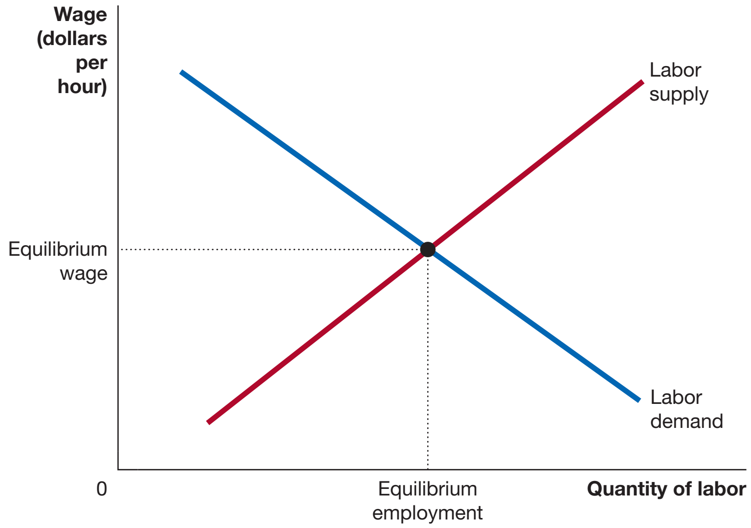


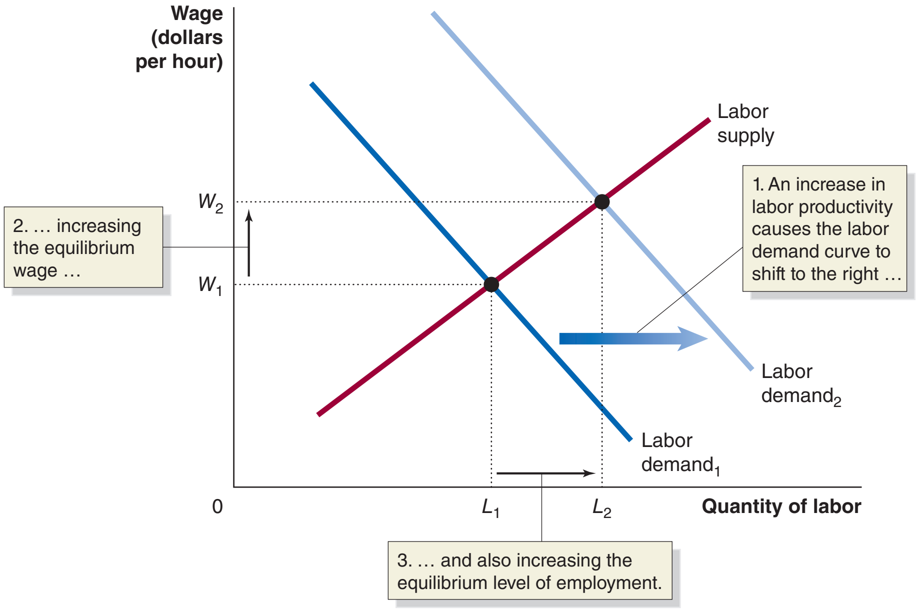
Figure 16.4

Equilibrium in the Labor Market

As in other markets, equilibrium in the labor market occurs where the demand curve for labor and the supply curve of labor intersect.

The Effect on Equilibrium Wages of a Shift in Labor Demand

In many labor markets, increases over time in labor productivity will cause the demand for labor to increase. As Figure 16.5 shows, if labor supply is unchanged, an increase in labor demand will increase both the equilibrium wage and the number of workers employed.



1. An increase in labor productivity causes the labor demand curve to shift to the right …

2. … increasing the equilibrium wage …

3. … and also increasing the equilibrium level of employment.

Figure 16.5

The Effect of an Increase in Labor Demand

Increases in labor demand will cause the equilibrium wage and the equilibrium level of employment to rise:

1. If the productivity of workers rises, the value of the marginal product of labor increases, causing the labor demand curve to shift to the right.
2. The equilibrium wage rises from W_1 to W_2.
3. The equilibrium level of employment rises from L_1 to L_2.

The Effect of Immigration on the U.S. Labor Market

In recent years, there has been lively debate among policymakers over the effects of immigration on the U.S. economy. President Donald Trump argued that, on balance, immigration has had a net negative effect on the U.S. economy, and he proposed policies to reduce immigration, particularly illegal or undocumented immigration across the U.S.–Mexico border. Although the Biden administration has proposed significant changes to U.S. immigration law, as of mid–2023, Congress hadn't acted on these proposals.

Figure 16.6 shows annual legal immigration into the United States as a percentage of the U.S. population. Large numbers of Irish immigrants entered the United States during the Irish potato famine of the 1840s. The great immigration wave that began around 1880 was primarily composed of people from Southern and Eastern Europe and largely came to an end with the outbreak of World War I in 1914. After an increase in immigration following the war, Congress passed the Immigration Act of 1924, which resulted in lower rates of immigration until Congress passed less restrictive legislation in 1965. The Immigration Act of 1990 raised ceilings on legal immigration and resulted in a temporary surge in immigration. In recent years, the bulk of immigrants have come from Latin America and Asia, particularly China and India. In 2021, the foreign-born population of the United States was about 44.8 million, of which about 10.8 million were undocumented. This number was down from 45.8 million foreign-born people in 2019 due to shifts in immigration policy and restrictions on entry into the United States during the Covid–19 pandemic. In 2021, the foreign-born population was about 13.7 percent of the total U.S. population, which was about 326 million people in that year.

Policymakers and economists have debated the overall effects of immigration on the U.S. economy. The most direct effect of immigration is an increase in the labor supply. As Figure 16.7 shows, if labor demand is unchanged, an increase in the labor supply due to immigration will decrease the equilibrium wage while increasing the number of workers employed.

The analysis in Figure 16.7 is simplified because it assumes that there is only a single national labor market, while in reality there are many regional labor markets as well as different markets for different types of labor. The analysis also assumes that immigration does not affect the demand for labor, which it may if, for example, immigrants are responsible for innovations that raise productivity and, therefore, the demand for labor.

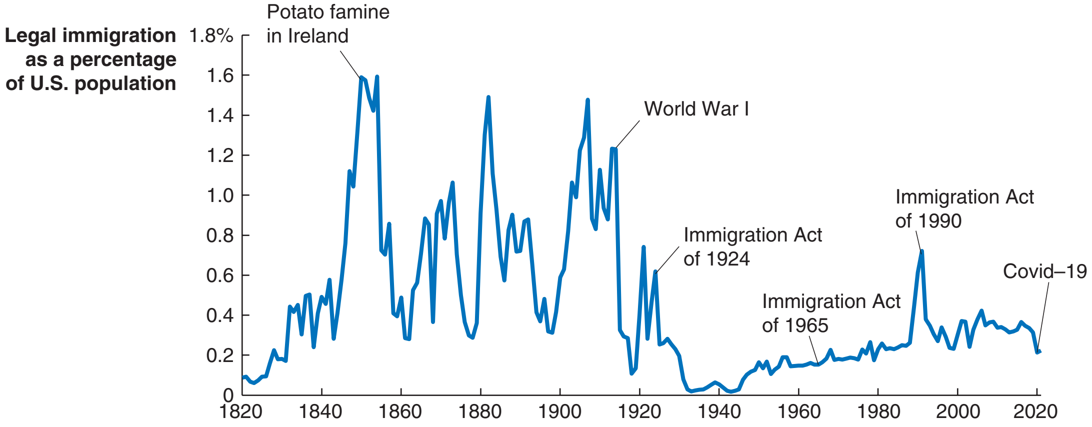


Figure 16.6 **Legal Immigration into the United States since 1820**

Prior to the early 1920s, there were few restrictions on immigration into the United States. Congressional legislation limited immigration from the 1920s through the mid-1960s, until Congress eased restrictions with the passage of the Immigration Act of 1965. A surge in immigration followed passage of the Immigration Act of 1990. Immigration declined each year between 2018 and 2021. In 2021, the foreign-born population was about 13.7 percent of the total U.S. population.

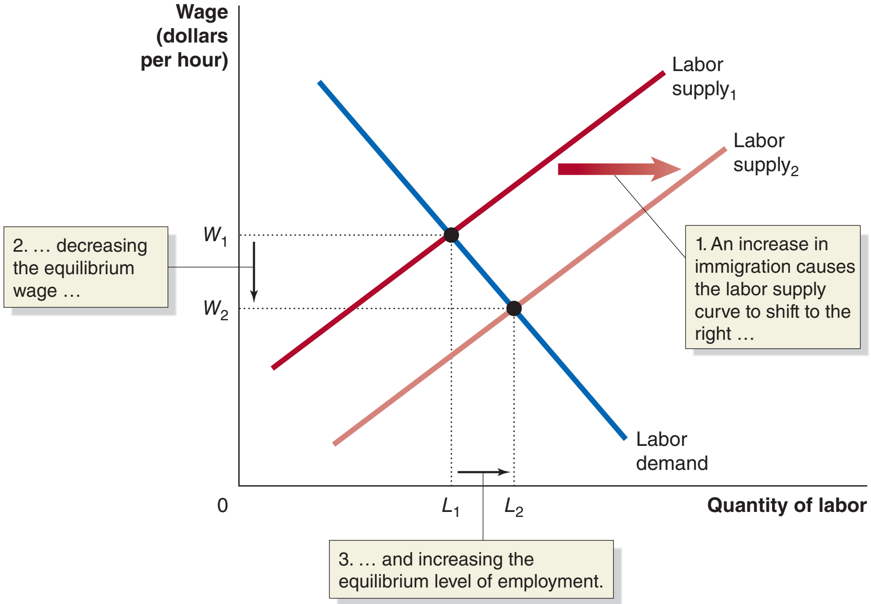
Sources: U.S. Department of Homeland Security, "Yearbook of Immigration Statistics," Table 1; and Susan B. Carter, Scott Sigmund Gartner, Michael R. Haines, Alan L. Olmstead, Richard Sutch and Gavin Wright, eds., "Historical Statistics of the United States, Millennial Edition Online," Series Aa7.

Figure 16.7

The Effect of an Increase in the Labor Supply Due to Immigration

Increases in labor supply cause the equilibrium wage to fall but the equilibrium level of employment to rise:

1. Immigration causes the labor supply curve to shift to the right.
2. The equilibrium wage falls from W_1 to W_2.
3. The equilibrium level of employment increases from L_1 to L_2.



The great immigration wave from 1880 to 1914 appears to have had a surprisingly small effect on average wages. Some economists believe that the increase in the labor supply due to immigration helped spur the rise of high-productivity mass-production methods in the automobile and other industries. The resulting increase in the marginal product of labor increased labor demand sufficiently to offset the increase in labor supply, leaving the average wage rate largely unchanged. Economists' estimates of the effect on wages of recent immigration vary, but some economists believe that immigration is likely to have reduced the wages of low-skilled native-born workers. Such a result is consistent with the outcome shown in Figure 16.7, under the assumption that increased immigration has not affected the demand for labor in the market for unskilled workers.

Currently, legal immigrants to the United States are on average older and somewhat more likely to be college graduates than the native-born population, while undocumented immigrants are younger and significantly less likely to be college graduates. Both legal and undocumented male immigrants are more likely to be employed than are native-born males, while women immigrants are less likely to be employed than are native-born women.

The economic and non-economic effects of immigration are too wide-ranging to be analyzed in this text but include such issues as (1) the increasing fraction of STEM (science, technology, engineering, and mathematics) workers who are immigrants and the contributions these workers make to technological progress in the United States, (2) the effect of immigrants on local governments' social services and school budgets, (3) the rate at which new immigrants assimilate into U.S. society, (4) the role of immigration in maintaining population growth during a period of declining U.S. birth rates, and (5) the concentration of immigrant workers in certain industries, including farming, construction, hotels, and restaurants.

Apply the Concept

Will You Compete with Robots and Chatbots for a Job—Or Work with Them?

Will you have trouble finding a job because robots and chatbots are becoming sophisticated enough to replace people in a wide range of occupations? Economists who study the effects of these technologies on the job market are divided in their answers to this question. With respect to robots, although there is no universally agreed-upon definition of robots, most economists consider them a type of capital that performs sophisticated physical activities that previously only people performed. For example, the self-driving trucks Rio Tinto uses, as described in the chapter opener, are robots, while a personal computer is not.

Fears that firms will permanently reduce their demand for labor as they increase their use of capital date back at least to the late 1700s in England, when textile workers known as *Luddites*—after their leader Ned Ludd—smashed machinery in an attempt to save their jobs. Since that time, the term *Luddite* has described people who oppose firms increasing their use of machinery and other capital because they fear the increases will result in permanent job losses. Economists believe that these fears often stem from the *lump-of-labor fallacy*, which holds that there is only a fixed amount of work to be performed in the economy. So the more work that machines perform, the less work that will be available for people to perform.

But capital is a *complement* to labor, as well as a substitute for it. For instance, although some automobile workers lost their jobs as firms began to use robots to weld car chassis, the remaining workers became more productive because they had additional capital to work with, and their productivity resulted in higher wages. In fact, most economists agree that the main reason that the wages of workers today are much higher than they were 100 years ago is that workers today are much more productive because they have more capital to work with. Higher productivity can also reduce firms' costs, leading to lower prices. Lower prices increase the quantity of goods demanded and, therefore, the demand for labor.

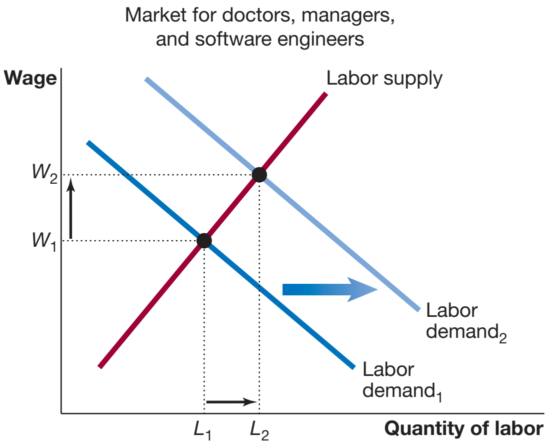
Will this long-run trend toward ever higher productivity and wages continue as more of the increases in capital involve new technologies such as robots and chatbots? Most economists are optimistic that these new technologies will lead to higher productivity and wages, although some economists take a more pessimistic view. For example, Carl Benedikt Frey and Michael A. Osborne of the University of Oxford estimate that as many as 47 percent of U.S. workers could lose their current jobs to new technology such as robots. Seth Benzell of Boston University and colleagues argue that it is possible that although the higher productivity due to robots will result in lower prices of goods and services, this benefit will be offset by the lower wages workers earn after losing their current jobs. In 2023, *large language model (LLM)–based chatbots* such as ChatGPT were still new technology, and so estimating their ultimate effect on the job market is difficult. As we saw in the chapter opener, a study by researchers at OpenAI and the University of Pennsylvania estimates that a majority of U.S. workers are likely to find chatbots affecting their jobs to a limited extent, and about 19 percent of workers are likely to find their work significantly affected. It's too early to tell whether these estimates are overstating or understating the ultimate effect chatbots will have on the job market.

Economists have also looked at the effects of robots and other new technologies on particular occupations. David Autor, of the Massachusetts Institute of Technology, has divided workers into three broad categories: highly skilled workers, middle-skilled workers, and low-skilled workers. We can use labor demand and supply analysis to explain the trends in employment and wages in these three categories of workers:

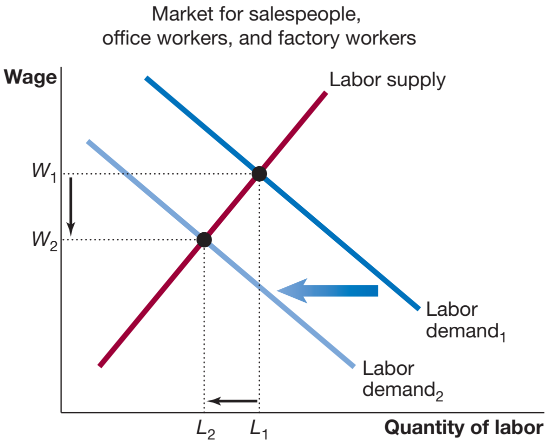
1. **Highly skilled workers, such as doctors, lawyers, managers, and software engineers.** Both employment and wages in these occupations have generally increased in recent years. In this category of workers, robots and other new technologies are often complementary to workers. As a result, the productivity of these workers has been increasing, raising the demand for them. For instance, Rio Tinto has substantially increased its demand for network technicians with mechanical engineering and electrical engineering skills to maintain and remotely operate its robotic drills and trucks. The effect of chatbots on the demand for these workers is more uncertain. For example, chatbots that have been given patients' symptoms and lab results have proven better than many health professionals at diagnosing the patients. Chatbots have also been able to interpret x-rays and similar medical images with greater accuracy than the typical radiologist. Chatbots have proven successful in writing some computer code and legal briefs. So highly skilled workers who have mainly been performing routine tasks like these may find that the demand for their services will decline. But chatbots may also be complementary to the work of some people in highly skilled occupations, such as surgeons, trial lawyers, and software

engineers working on state-of-the-art software design problems or on expanding the capabilities of chatbots.

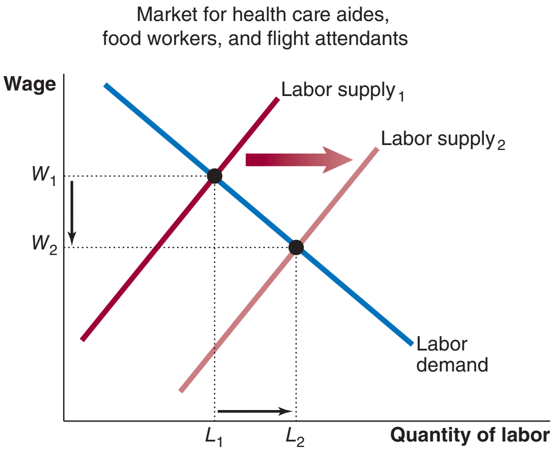
The following figure assumes that new technologies are more likely to be complements than to be substitutes for workers in this category. The figure shows the demand curve for these workers shifting to the right, from Labor demand$_1$ to Labor demand$_2$, resulting in an increase in the equilibrium wage and in the equilibrium quantity of workers employed. The labor supply curve in these occupations is likely to be relatively inelastic because these workers have skills and specialized training—and some have advanced degrees—which means it takes substantial time before rising wages significantly increase the quantity of labor supplied.



2. **Middle-skilled workers, such as salespeople, office workers, carpenters, plumbers, and factory workers.** Both employment and wages in these occupations have generally declined in recent years. In this category, robots and new technology, including LLM-based chatbots, are often substitutes for workers. For instance, the robotic truck and drill technologies at Rio Tinto's mines are substitutes for the drivers and drill operators the company previously employed. Chatbots may replace some salespeople by, for example, developing superior marketing plans and by interacting with clients online. Chatbots may also replace some office workers by quickly and accurately responding to customer questions and complaints. The largest user of industrial robots in the United States is the automobile industry. U.S. automobile firms have installed robots to allow them to produce the same level of output using fewer workers. The following figure shows the demand curve for workers in this category shifting to the left, from Labor demand$_1$ to Labor demand$_2$, resulting in a decrease in the equilibrium wage and in the equilibrium quantity of workers employed. (Note, though, that in the case of automobile workers, rising productivity has resulted in higher wages.)



3. **Low-skilled workers, such as health care aides, janitors, and flight attendants.** Employment has generally increased in these occupations in recent years, but wages have declined. Robots and new technology, including LLM-based chatbots, have relatively little effect on the workers in this category. For the most part, robots have not replaced servers in restaurants, home health care aides, and similar workers. It also seems unlikely that chatbots will be substitutes for these workers. Nor are the new technologies complements to the tasks these workers perform, such as serving food, cleaning, and helping elderly individuals. New technologies have therefore not had a significant effect on the demand for these workers. (Although the aging of the population and rising incomes have increased demand for the services some of these workers provide, for simplicity, we will ignore this fact.) The following figure shows the labor demand curve as unchanged. However, some workers from the second category—factory workers and office workers, for example—who have lost their jobs have shifted into the occupations in this third category, causing the labor supply curve to shift to the right, from Labor supply$_1$ to Labor supply$_2$, resulting in an increase in the equilibrium quantity of workers employed but a decrease in the equilibrium wage.



The process of workers and firms adapting to new technologies such as robots and chatbots is ongoing, and economists continue to debate what the long-run consequences of these technologies will be.

Your Turn: Test your understanding by doing related problems 3.9 and 3.10 at the end of this chapter.

16.4 Explaining Differences in Wages

LEARNING OBJECTIVE: Use demand and supply analysis to explain how compensating differentials, discrimination, and labor unions cause wages to differ.

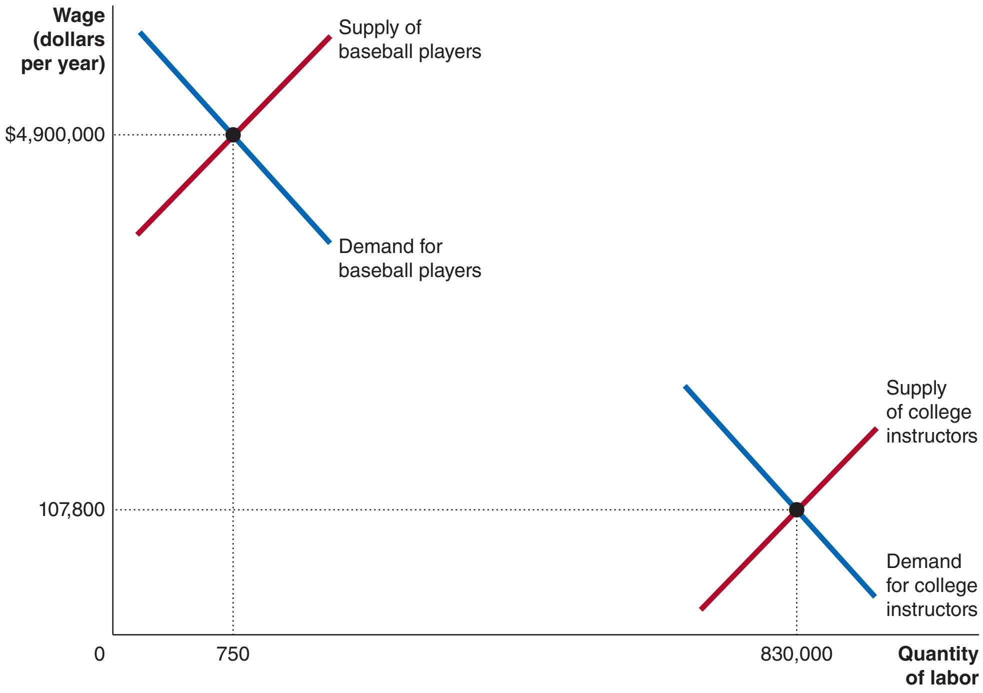
A key conclusion of our discussion of the labor market is that the equilibrium wage equals the value of the marginal product of labor. The more productive workers are and the higher the price for which workers' output can be sold, the higher the wages workers will receive. We can expand on this conclusion by using the demand and supply model to analyze why wages differ. For instance, many people wonder why professional athletes are paid so much more than most other workers. Figure 16.8 shows the demand and supply curves for Major League Baseball (MLB) players and the demand and supply curves for college instructors.

Consider the value of the marginal product of labor of baseball players, which is the additional revenue a team owner will receive from hiring one more player.

Figure 16.8

Baseball Players Are Paid More Than College Instructors

The value of the marginal product of labor of baseball players is very high, and the supply of people with the ability to play Major League Baseball (MLB) is low. As a result, in 2023, the 750 MLB players received an average wage of $4,900,000. The value of the marginal product of labor of college instructors is much lower, and the supply of people with the ability to be college instructors is much higher. So, in 2023, the 830,000 full-time college instructors in the United States received an average wage of $107,800, far below the average wage of baseball players.



Baseball players are hired to produce baseball games that are then sold to fans, who pay admission to baseball stadiums, and to radio and television stations, cable systems, and apps that broadcast or stream the games. Because a baseball team can sell each baseball game for a large amount, the value of the marginal product of labor of baseball players is high. The supply of people with the ability to play professional baseball is also very limited. As a result, the average annual salary of the 750 MLB players was $4,900,000 in 2023.

The value of the marginal product of labor of full-time college instructors is much lower than for baseball players. College instructors are hired to produce college educations that are sold to students and their parents. Although one year's college tuition is quite high at many colleges, hiring one more full-time instructor allows a college to admit at most a few more students. So, the value of the marginal product of a college instructor is much lower than the value of the marginal product of a baseball player. There are also many more people who possess the skills to be a college instructor than who possess the skills to be an MLB player. As a result, the average annual salary of the country's 830,000 full-time college instructors was about $107,800 in 2023.

We can use this analysis to answer the additional question of why the best professional athletes tend to end up in the largest cities. For example, in 2023, the highest-paid baseball player was New York Mets pitcher Max Scherzer, whose salary was $43.3 million. (In July 2023, the Mets traded Scherzer to the Texas Rangers.) Why were the Mets willing to pay Scherzer more than other teams, such as the Pittsburgh Pirates or the Kansas City Royals, would? Scherzer's marginal product—which we can think of as the extra games a team will win by employing him—should be about the same in New York as in Pittsburgh or Kansas City. But his *value of marginal product of labor* will be higher in New York. Because the Mets play in the largest metropolitan area in the United States, the number of Mets fans is much larger than the number of Pittsburgh Pirates or Kansas City Royals fans. (Pittsburgh is the twentieth-largest metropolitan area, and Kansas City is the twenty-fourth largest.) Therefore, winning additional games will result in a greater increase in attendance at Mets games than it would at Pirates or Royals games. It will also result in a greater increase in people watching Mets games on television or as streaming video. As a result, the Mets were able to sell the extra wins that Scherzer produces for much more than the Pirates or Royals could. This difference explains why the Mets were willing to pay Scherzer much more than the Pirates or Royals were.

Don't Let This Happen to You

Remember That Prices and Wages Are Determined at the Margin

You've probably heard a remark like this: "We could live without baseball, but we can't live without the trash being hauled away. In a more rational world, trash collectors would be paid more than baseball players." This remark seems logical: The total value to society of having the trash hauled away certainly is greater than the total value of baseball games. But wages—like prices—do not depend on total value but on *marginal* value. The *additional* baseball games the New York Mets expected to win by employing Max Scherzer instead of a less skilled pitcher would have resulted in millions of dollars in increased revenue. The supply of people with the ability to play Major League Baseball is very limited. The supply of people with the ability to be trash collectors is much greater. If a trash-hauling firm hires another worker, the *additional* trash-hauling services it can then offer will bring in a relatively small amount of revenue. The *total* value of baseball games and the *total* value of trash hauling are not relevant in determining the relative salaries of baseball players and trash collectors.

This point is related to the *diamond and water paradox* Adam Smith noted in 1776, in his book *The Wealth of Nations*. On the one hand, water is very valuable—we literally couldn't live without it—but its price is very low. On the other hand, apart from a few industrial purposes, diamonds are used only for jewelry, yet their price is quite high. We resolve the paradox by noting that the price of water is low because the supply is very large, and the additional benefit consumers receive from the last gallon purchased is low. The price of diamonds is high because the supply is very small, and the additional benefit consumers receive from the last diamond purchased is high.

Your Turn: Test your understanding by doing related problem 4.6 at the end of the chapter.

Apply the Concept

Technology and the Earnings of "Superstars"

Gordon Donovan/NurPhoto/Shutterstock

Why does Max Scherzer earn more today relative to the typical baseball player than baseball stars did in the 1950s and 1960s?

The gap between Max Scherzer's salary and the salary of the lowest-paid baseball players is much greater than the gap between the salaries paid during the 1950s and 1960s to top players such as Mickey Mantle and Willie Mays and the salaries of the lowest-paid players. Similarly, the gap between the $20 million Scarlett Johansson is paid to star in a movie and the salary paid to an actor in a minor role is much greater than the gap between the salaries paid during the 1930s and 1940s to stars such as Clark Gable and Cary Grant and the salaries paid to bit players. In fact, in most areas of sports and entertainment, the highest-paid performers—the "superstars"—now have much higher incomes relative to other members of their professions than was true a few decades ago.

The increase in the relative incomes of superstars is mainly due to technological advances. The spread of cable television and online streaming has increased the number of potential viewers of Mets games, but many of those viewers will watch only if the Mets are winning. This growth in viewers increases the value to the Mets of winning games and, therefore, increases Scherzer's value of the marginal product and the salary he can earn.

With Blu-ray discs, DVDs, streaming video, Netflix, and pay-per-view cable, the value to movie studios of producing a hit movie has greatly risen. Not surprisingly, movie studios have also increased their willingness to pay large salaries to stars such as Scarlett Johansson and Dwayne Johnson because they think these superstars will significantly increase the chances that a film will be successful.

This process has been going on for a long time. For instance, before the invention of the motion picture, anyone who wanted to see a play had to attend the theater and see a live performance. Limits on the number of people who could see the best actors and actresses perform created an opportunity for many more people to succeed in the acting profession, and the gap between the salaries earned by the best actors and the salaries earned by average actors was relatively small. Today, when a hit movie starring Scarlett Johansson is available on DVD or streaming, millions of people will buy or rent it, and they will not be forced to spend money to see a less popular actor, as their great-great-grandparents might have been.

Your Turn: Test your understanding by doing related problems 4.8 and 4.9 at the end of this chapter.

Differences in the value of the marginal products are the most important factor in explaining differences in wages, but they are not the whole story. To provide a more complete explanation for differences in wages, we must take into account three important aspects of labor markets: compensating differentials, discrimination, and labor unions.

Compensating Differentials

Suppose Paul runs a pizza restaurant and acquires a reputation for being a bad boss who yells at his workers and is generally unpleasant. Two blocks away, Brendan also runs a pizza restaurant, but he is always very polite to his workers. We would expect in these circumstances that Paul will have to pay a higher wage than Brendan to attract and retain workers. A difference in wages that compensates workers for unpleasant aspects of a job is called a **compensating differential**.

Compensating differential A difference in wages that compensates workers for unpleasant aspects of a job.

If working in a dynamite factory requires the same degree of training and education as working in a semiconductor factory but is much more dangerous, a larger number of workers will want to work making semiconductors rather than dynamite. As a consequence, the wages of dynamite workers will be higher than the wages of semiconductor workers. We can think of the difference in wages as being *the price of risk*. As each worker decides on his or her willingness to assume risk and decides how much higher the wage must be to compensate for assuming more risk, wages will adjust so that dynamite factories will pay wages that are just high enough to compensate workers who choose to work there for the extra risk they assume. Only when workers in dynamite factories have been fully compensated with higher wages for the additional risk they assume will dynamite companies be able to attract enough workers.

One surprising implication of compensating differentials is that *laws protecting the health and safety of workers may not make workers better off*. To see this point, suppose that dynamite factories pay wages of $35 per hour and semiconductor factories pay wages of $30 per hour, with the $5 difference in wages being a compensating differential for the greater risk of working in a dynamite factory. Suppose that the government passes a law regulating the manufacture of dynamite in order to improve safety in dynamite factories. As a result of this law, dynamite factories are no longer any more dangerous than semiconductor factories. Once this change occurs, the wages in dynamite factories will decline to $30 per hour, the same as in semiconductor factories. Are workers in dynamite factories any better or worse off? Before the law was passed, their wages were $35 per hour, but $5 per hour was a compensating differential for the extra risk they were exposed to. Now the extra risk has been eliminated, but their wages are only $30 per hour. The conclusion seems to be that dynamite workers are no better off as a result of the safety legislation.

This conclusion is true, though, only if the compensating differential actually does compensate workers fully for the additional risk. Nobel Laureate George Akerlof of Georgetown University and William Dickens of Northeastern University have argued that the psychological principle known as *cognitive dissonance* might cause workers to underestimate the true risk of their jobs. According to this principle, people prefer to think of themselves as intelligent and rational and tend to reject evidence that seems to contradict this image. Because working in a very hazardous job may seem irrational, workers in such jobs may refuse to believe that the jobs really are hazardous. Akerlof and Dickens present evidence that workers in chemical plants producing benzene and workers in nuclear power plants underestimate the hazards of their jobs. If Akerlof and Dickens are correct, the wages of these workers will not be high enough to compensate them fully for the risk they have assumed. So, in this situation, safety legislation may make workers better off.

Discrimination

Economic discrimination The practice of paying a person a lower wage or excluding a person from an occupation on the basis of an irrelevant characteristic such as race or gender.

Table 16.2 shows that in the United States, white men on average earn more than the other groups listed. One possible explanation for this fact is **economic discrimination**, which is the practice of an employer paying a person a lower wage or excluding a person from an occupation on the basis of an irrelevant characteristic such as race or gender.

Table 16.2

Why Do White Men Earn More Than Other Groups?

Group	Weekly Earnings
White men	$1,201
White women	1,016
Black men	975
Hispanic or Latino men	892
Black women	877
Hispanic or Latino women	788

Note: The values are median weekly earnings for full-time wage and salary workers. Persons of Hispanic or Latino origin can be of any race.

Source: U.S. Bureau of Labor Statistics, "Usual Weekly Earnings of Wage and Salary Workers, Second Quarter 2023," July 18, 2023.

If employers discriminated by hiring only white men for high-paying jobs or by paying white males higher wages than other groups with comparable preparation and skills working the same jobs, white men would have higher earnings, as Table 16.2 shows. However, excluding groups from certain jobs or paying one group more than another has been illegal in the United States since the passage of the Equal Pay Act of 1963 and the Civil Rights Act of 1964. Nevertheless, it is possible that employers are ignoring the law and practicing economic discrimination.

Most economists believe that only part of the gap between the wages of white men and the wages of other groups is due to discrimination. Instead, some of the gap is explained by three main factors:

1. Differences in education
2. Differences in experience
3. Differing preferences for jobs

Differences in Education Some of the difference between the incomes of white workers and the incomes of Black workers can be explained by differences in education. Historically, African Americans and Hispanics or Latinos have had less schooling than have whites. The gap has narrowed significantly over the years, but it has not completely closed. A higher percentage of white students graduate on time from public high schools than do African American or Hispanic or Latino students. Similarly, a higher percentage of the white population aged 25 and older has graduated from college than is true of the African American or Hispanic or Latino populations. Studies have shown that differing levels of education can account for a significant part of the gap between the earnings of different ethnic groups. Some of the difference in educational levels may reflect past and current discrimination by governments in failing to provide equal educational opportunities.

Differences in Experience Women are much more likely than men to leave their jobs for a period of time after the birth or adoption of a child. Women with several children will sometimes have multiple interruptions in their careers. Some women leave the workforce for several years until their children are of school age. As a result, on average, women with children have less workforce experience than do men of the same age. Because workers with greater experience are, on average, more productive, the difference in levels of experience helps explain some of the difference in earnings between men and women.

Differing Preferences for Jobs Significant differences exist between the types of jobs held by women and men:

- Women represent 90 percent or more of the people employed in some relatively low-paying jobs, such as preschool teachers, dental assistants, and childcare workers.
- Men represent more than 90 percent of the people employed in some relatively high-paying jobs, such as airline pilots, engineering managers, and electricians.

Although the overrepresentation of women in low-paying jobs and men in high-paying jobs may be due, in part, to discrimination, it is also likely to reflect differences in job preferences between men and women. For example, because many women interrupt their careers—at least briefly—when their children are born, they are more likely to take jobs where work experience is less important. More women may also be likely to take jobs, such as teaching, that allow them to be home in the afternoons when their children return from school.

The Difficulty of Measuring Discrimination When two people are paid different wages, discrimination may be the explanation. But differences in productivity or preferences may also be explanations. Labor economists have attempted to measure how much of the differences in wages between Black workers and white workers and between men and women is due to discrimination and how much is due to other factors. Unfortunately, it is difficult to precisely measure differences in productivity or in worker preferences. As a result, we can't know exactly the extent of economic discrimination in the United States today.

Solved Problem 16.4

Is Passing "Comparable Worth" Legislation a Good Way to Close the Gap between Men's and Women's Pay?

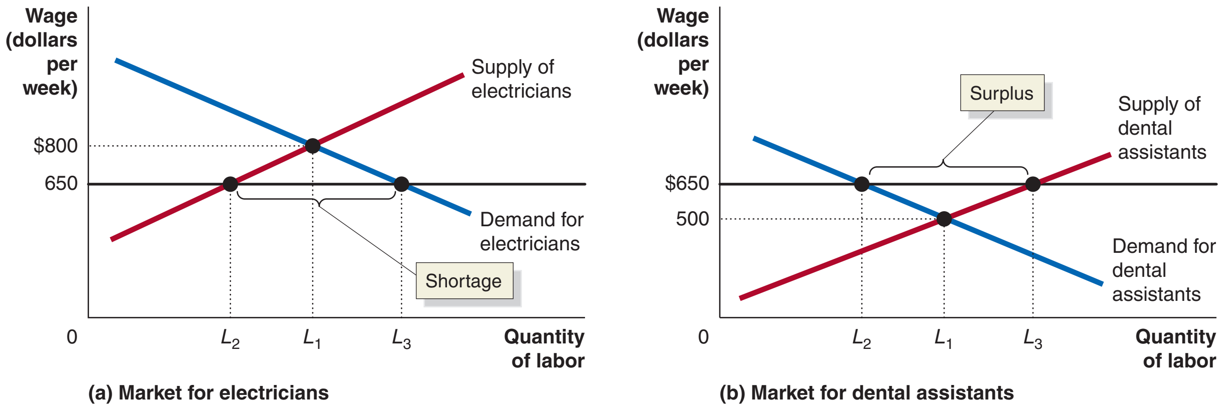
As we have seen, because of either discrimination or differing preferences, certain jobs are filled primarily by men, and other jobs are filled primarily by women. On average, the "men's jobs" have higher wages than the "women's jobs." Some commentators have argued that many "men's jobs" are more highly paid than "women's jobs," despite the jobs being comparable in terms of the education and skills required and the working conditions involved. These commentators have argued that the earnings gap between men and women could be closed at least partially if the government required employers to pay the same wages for jobs that have *comparable worth*. Many economists are skeptical of these proposals because they believe allowing markets to determine wages results in a more efficient outcome.

Suppose that electricians are currently being paid a market equilibrium wage of $800 per week, and dental assistants are being paid a market equilibrium wage of $500 per week. Comparable-worth legislation is passed, and a study finds that an electrician and a dental assistant have comparable jobs, so employers will now be required to pay workers in both jobs $650 per week. Analyze the effects of this requirement on the market for electricians and on the market for dental assistants. Be sure to use demand and supply graphs.

Solving the Problem

Step 1: Review the chapter material. This problem is about economic discrimination, so you may want to review the section "Discrimination."

Step 2: Draw the graphs. When the government sets the price in a market, the result is a surplus or a shortage, depending on whether the government-mandated price is above or below the competitive market equilibrium (see Chapter 4, Section 4.3). A wage of $650 per week is below the market wage for electricians and above the market wage for dental assistants. Therefore, we expect the requirement to result in a shortage of electricians and a surplus of dental assistants.



In panel (a), without comparable-worth legislation, the equilibrium wage for electricians is \$800, and the equilibrium quantity of electricians hired is L_1. Setting the wage for electricians below equilibrium at \$650 reduces the quantity of labor supplied in this occupation from L_1 to L_2 but increases the quantity of labor demanded by employers from L_1 to L_3. The result is a shortage of electricians equal to $L_3 - L_2$, as shown by the bracket in the graph.

In panel (b), without comparable-worth legislation, the equilibrium wage for dental assistants is \$500, and the equilibrium quantity of dental assistants hired is L_1. Setting the wage for dental assistants above equilibrium at \$650 increases the quantity of labor supplied in this occupation from L_1 to L_3 but reduces the quantity of labor demanded by employers from L_1 to L_2. The result is a surplus of dental assistants equal to $L_3 - L_2$, as shown by the bracket in the graph.

Extra Credit: Most economists are skeptical of government attempts to set wages and prices as comparable-worth legislation would require. Supporters of comparable-worth legislation, by contrast, see differences between men's and women's wages as being mainly due to discrimination and see government legislation as a solution.

Your Turn: For more practice, do related problems 4.17 and 4.18 at the end of this chapter.

Apply the Concept

Does Greg Have an Easier Time Finding a Job Than Jamal?

One difficulty in accurately measuring economic discrimination is that two workers may not only differ in race and gender but also in characteristics that employers expect will affect the workers' productivity. If Worker A is hired instead of Worker B, is it because A is a white man, while B is a Black woman, or is it because of other characteristics of Worker A and Worker B?

Marianne Bertrand of the University of Chicago and Sendhil Mullainathan of Harvard University found an ingenious way of analyzing the extent of economic discrimination. They responded to help wanted ads in newspapers by submitting identical résumés, with the exception that half of the résumés were assigned an African American–sounding name and half were assigned a white-sounding name. (The names were selected by examining birth certificates for names that were nearly always given to either white babies or to African American babies.) In other words, the characteristics of these fictitious people were the same except for their names. Bertrand and Mullainathan based their artificial résumés on actual résumés, so the artificial résumés included the characteristics that actual job applicants think are relevant to employers in assessing the applicants' productivity. In the absence of discrimination, résumés with African American–sounding names, such as Jamal Jones, should have been as likely to get job interviews as the identical résumés with white-sounding names, such as Greg Baker. Bertrand and Mullainathan submitted more than 5,000 résumés to many different employers who were advertising for jobs in sales, administrative support, clerical services, and customer service. They found that employers were 50 percent more likely to interview workers with white-sounding names than to interview workers with African American–sounding names.

Ronnie Kaufman/DigitalVision/Getty Images

Does having an African American–sounding name make it more difficult to find a job?

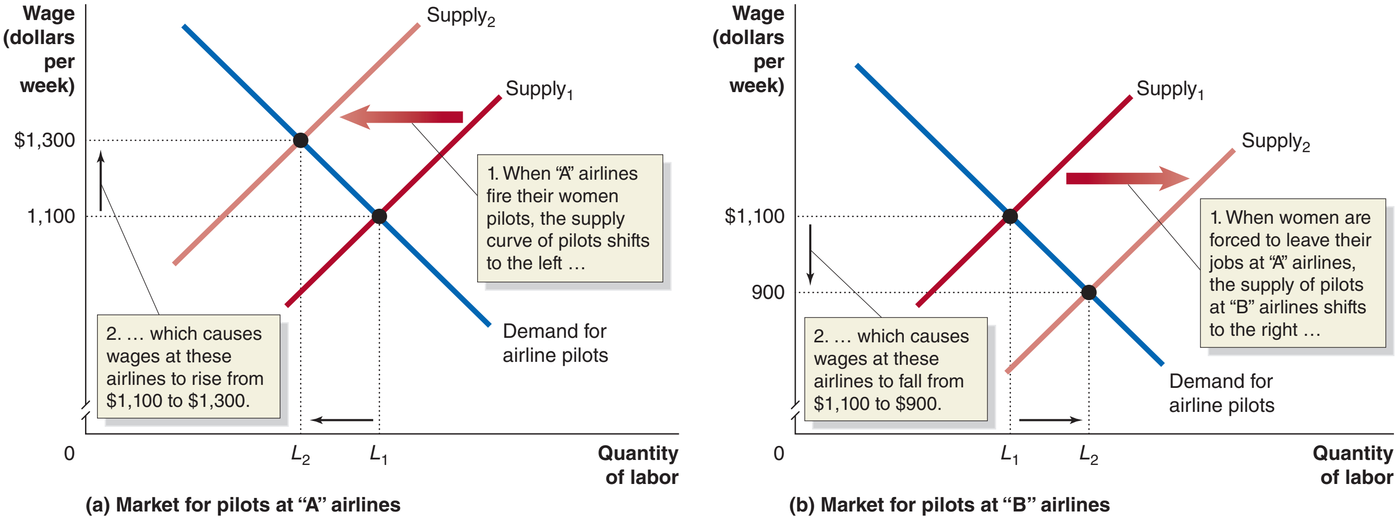
As a further test for the presence of discrimination, the authors divided résumés into high- and low-quality categories. High-quality résumés might include extra computer skills, volunteer work, or military experience. Although white candidates submitting high-quality résumés were significantly more likely to be interviewed, African American candidates submitting high-quality résumés were not. Bertrand and Mullainathan conclude that the results of their experiment show that "differential treatment by race . . . appears to still be prominent in the U.S. labor market."

Your Turn: Test your understanding by doing related problems 4.19 and 4.20 at the end of this chapter.

Does It Pay to Discriminate? Many economists believe that in the long run, markets can undermine economic discrimination. One reason is that *employers that discriminate pay an economic penalty*. To see why, let's consider a simplified example. Suppose that men and women are equally qualified to be airline pilots and that, initially, airlines do not discriminate. In Figure 16.9, we divide the airlines into two groups: "A" airlines and "B" airlines. If neither group of airlines discriminates, we would expect them to pay an equal wage of $1,100 per week to both men and women pilots. Now suppose that "A" airlines decide to break the law and discriminate by firing all their women pilots. This action will reduce the supply of pilots to these airlines and, as shown in panel (a), will force up the wage from $1,100 to $1,300 per week. At the same time, as women fired from the jobs with "A" airlines apply for jobs with "B" airlines, the supply of pilots to "B" airlines will increase, and the equilibrium wage will fall from $1,100 to $900 per week. All the women pilots will end up being employed at the nondiscriminating airlines and will be paid a lower wage than the men who are employed by the discriminating airlines.

But this situation cannot persist for two reasons. First, male pilots employed by "B" airlines will also receive the lower wage. This lower wage gives them an incentive to quit their jobs at "B" airlines and apply at "A" airlines, which will shift the labor supply curve for "B" airlines to the left and the labor supply curve for "A" airlines to the right. Second, "A" airlines are paying $1,300 per week to hire pilots who are no more productive than the pilots being paid $900 per week by "B" airlines. As a result, "B" airlines will have lower costs and will be able to charge lower prices. Eventually, high-price "A" airlines will lose their customers to low-price "B" airlines and will be driven out of business. The market will have imposed an economic penalty on the discriminating airlines. So, discrimination will not persist, and the wages of men and women pilots will become equal.

Can we conclude from this analysis that competition in markets will eliminate all economic discrimination? Unfortunately, this optimistic conclusion is not completely accurate. We know that until the Civil Rights Act of 1964 was passed, some firms in the United States refused to hire Black workers. Even though this practice had persisted for



(a) Market for pilots at "A" airlines

(b) Market for pilots at "B" airlines

Figure 16.9 **Discrimination and Wages**

In this hypothetical example, we assume that initially neither "A" airlines nor "B" airlines discriminate. As a result, men and women pilots receive the same wage of $1,100 per week at both groups of airlines. We then assume that "A" airlines discriminate by firing all their women pilots. Panel (a) shows that discrimination reduces the supply of pilots to "A" airlines and raises the wage paid by these airlines from $1,100 to $1,300. Panel (b) shows that discrimination increases the supply of pilots to "B" airlines and lowers the wage paid by these airlines from $1,100 to $900. All the women pilots will end up being employed at the nondiscriminating airlines and will be paid a lower wage than the men who are employed by the discriminating airlines.

decades, nondiscriminating competitors did not drive these firms out of business. Why not? There were four important factors:

1. **Worker discrimination.** In some cases, white workers refused to work alongside Black workers. As a result, some industries—such as the important cotton textile industry in the South—were all white. Because of discrimination by white workers, an entrepreneur who wanted to use low-cost Black labor might need to hire an all-Black workforce. Some entrepreneurs tried this approach, but because Black workers had been excluded from these industries, they often lacked the skills and experience to form an effective workforce.
2. **Customer discrimination.** Some white consumers were unwilling to buy from companies in certain industries if they employed Black workers. This discrimination was not a significant barrier in manufacturing industries, where consumers would not know the race of the workers producing the goods. It was, however, a problem for firms in industries in which workers came into direct contact with the public.
3. **Negative feedback loops.** Our analysis in Figure 16.9 assumed that men and women pilots were equally qualified. But if discrimination makes it difficult for a member of a group to find employment in a particular occupation, his or her incentive to be trained to enter that occupation is reduced. Consider the legal profession as an example. In 1952, future Supreme Court Justice Sandra Day O'Connor graduated third in her class at Stanford University Law School and was an editor of the *Stanford Law Review*, but for some time she was unable to get a job as a lawyer because in those years many law firms would not hire women. Given such bleak job prospects, it's not surprising that relatively few women entered law school. As a result, a law firm that did not discriminate would have been unable to hire women lawyers at a lower salary and use this cost advantage to drive discriminating law firms out of business. Notice the difference between this situation and the airline example discussed earlier. In this situation, an unfortunate *feedback loop* was in place: Few women prepared to become lawyers because many law firms discriminated against women, and nondiscriminating law firms were unable to drive discriminating law firms out of business because there were too few women lawyers available.
4. **Statistical discrimination.** Employers may lack complete information on a job applicant, but they may have—or believe they have—information on the average characteristics of the group to which the applicant belongs. For instance, an employer may believe that recent college graduates are less likely to work hard than are workers in their 30s. The employer may decline to hire George, who is 23, in favor of hiring Mary, who is 33—even though George is a harder worker than Mary. Rather than evaluate the two applicants as individuals, the employer has evaluated them on the basis of the groups they belong to. **Statistical discrimination** occurs when someone attributes the characteristics of a group to an individual who belongs to that group. If many employers practice statistical discrimination, market competition may not fully eliminate economic discrimination.

Statistical discrimination The practice of assigning the characteristics of a group to an individual who belongs to the group.

Most economists agree that the market imposes economic penalties on firms that discriminate, but because of the factors just discussed, it may take the market a very long time to eliminate discrimination entirely. The passage of the Civil Rights Act of 1964, which outlawed hiring discrimination on the basis of race and gender, greatly sped up the process of reducing economic discrimination in the United States.

Labor Unions

Workers' wages can differ depending on whether the workers are members of **labor unions**, which are organizations of employees that have the legal right to bargain with employers about wages and working conditions. If a union is unable to reach an agreement with a company, it has the legal right to call a *strike*, which means its members refuse to work until a satisfactory agreement has been reached. *Industrial unions*, such as the United Automobile Workers, attempt to organize all or most workers in an industry

Labor union An organization of employees that has a legal right to bargain with employers about wages and working conditions.

into a union. Craft unions, such as the International Brotherhood of Electrical Workers, organize workers with a particular skill or training, who may work in a variety of industries. In 2023, about 6 percent of private-sector and 33 percent of public-sector workers were union members. A smaller fraction of the labor force is unionized in the United States than in most other high-income countries.

In 2022, private-sector workers who were in unions earned an average of $1,216 per week, while nonunion workers earned an average of $1,029. Do union members earn more than nonunion members because they are in unions? The answer might seem to be "yes," but many union workers are in industries, such as automobile manufacturing, in which their value of the marginal products are high, so their wages would be high even if they were not unionized. Economists who have attempted to estimate statistically the effect of unionization on wages have concluded that being in a union increases a worker's wages about 10 percent, holding constant other factors, such as the industry the worker is in.

16.5 Personnel Economics

LEARNING OBJECTIVE: Discuss the role personnel economics can play in helping firms deal with human resources issues.

Traditionally, labor economists have focused on issues such as the effects of labor unions on wages or the determinants of changes in average wages over time. They have spent less time analyzing *human resources issues*, which address how firms hire, train, and promote workers and set their wages and benefits. Some labor economists, though, including Edward Lazear of Stanford University and William Neilson of the University of Tennessee, have applied economic analysis to human resources issues—a subject they call **personnel economics**.

Personnel economics The application of economic analysis to human resources issues.

Personnel economics analyzes the link between differences among jobs and differences in the way workers are paid. Jobs have different skill requirements, require more or less interaction with other workers, have to be performed in more or less unpleasant environments, and so on. Firms need to design compensation policies that take into account these differences among jobs. Personnel economics also analyzes other human resources policies, such as promotions, training, and pensions. In this brief overview, we look only at compensation policies.

Should Workers' Pay Depend on How Much They Work or on How Much They Produce?

One issue personnel economics addresses is when workers should receive *straight-time pay*—a certain wage per hour or salary per week or month—and when they should receive *commission* or *piece-rate pay*—a wage based on how much output they produce.

Suppose that Anne owns a car dealership and is trying to decide whether to pay her salespeople a salary of $800 per week or a commission of $200 on each car they sell. Figure 16.10 compares the compensation a salesperson would receive under the two systems, according to the number of cars the salesperson sells.

With a straight salary, the salesperson receives $800 per week, no matter how many cars she sells, which is shown by the horizontal line in Figure 16.10. If she receives a commission of $200 per car, her compensation will increase with every car she sells, as shown by the upward-sloping line. A salesperson who sells fewer than 4 cars per week would earn more by receiving a straight salary of $800 per week. A salesperson who sells more than 4 cars per week would be better off receiving the $200-per-car commission. We can identify two advantages Anne would receive from paying her salespeople commissions rather than salaries: She would attract and retain the most productive employees, and she would provide an incentive to her employees to sell more cars.

Suppose that other car dealerships are all paying salaries of $800 per week. If Anne pays her employees on commission, any of her employees who are unable to sell at least 4 cars per week can improve their pay by going to work for one of her competitors.

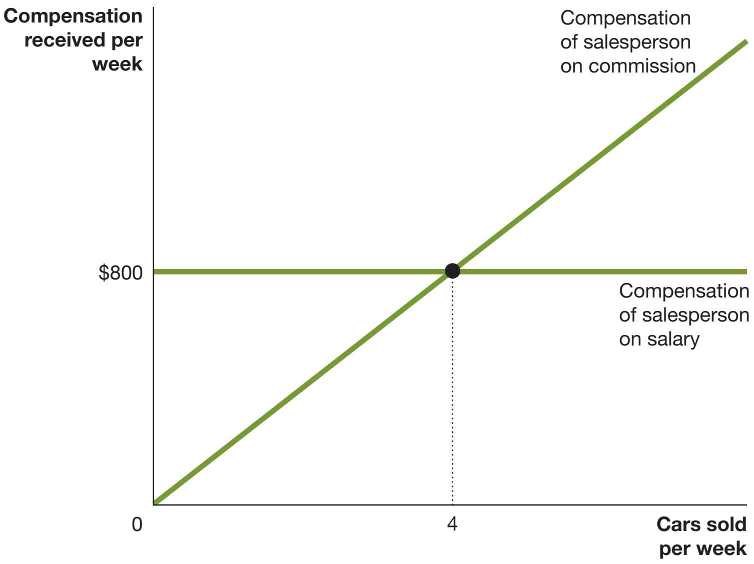


Figure 16.10

Paying Car Salespeople by Salary or by Commission

This figure compares the compensation a car salesperson receives if she is on a straight salary of $800 per week and if she receives a commission of $200 for each car she sells. With a straight salary, she receives $800 per week, no matter how many cars she sells. This outcome is shown by the horizontal line in the figure. If she receives a commission of $200 per car, her compensation will increase with every car she sells, as shown by the upward-sloping line. If she sells fewer than 4 cars per week, she would be better off with the $800 salary. If she sells more than 4 cars per week, she would be better off with the $200-per-car commission.

And any salespeople at Anne's competitors who can sell more than 4 cars per week can raise their pay by quitting and coming to work for Anne. Over time, Anne will find her least productive employees leaving, and she will be able to hire new employees who are more productive.

Paying a commission also increases the incentive Anne's salespeople have to sell more cars. If Anne paid a salary, her employees would receive the same amount no matter how few cars they sold. An employee on salary might decide on a particularly hot or cold day that it was less trouble to stay inside the building than to go out on the car lot to greet potential customers. An employee on commission would know that the additional effort expended on selling more cars would be rewarded with additional compensation.

Apply the Concept

A Better Way to Sell Contact Lenses

Many firms rely on salespeople to sell their goods. By one estimate, firms spend about three times as much on paying their salespeople as they do on advertising. Evidence on how salespeople respond to different ways of being compensated can be difficult to obtain. This difficulty arises partly because firms are often reluctant to discuss the details of their compensation plans with people outside the firm and partly because the connection between a firm's compensation plan and its sales can be difficult to determine, given other factors that may affect a firm's sales.

Sanjog Misra of the University of Chicago and Harikesh Nair of Stanford University were able to overcome some of these difficulties when a large contact lens manufacturer agreed to provide them with details of the firm's compensation plan and with detailed data on compensation received and sales made by individual salespeople. The firm uses its salespeople to market its contact lenses to ophthalmologists and opticians. It has no way of closely monitoring its salespeople's effort, so it needs to rely on its compensation plan to motivate them. At the time of the study, the firm's salespeople received a salary and could also earn a commission on sales over an assigned quarterly quota of lenses sold. The commission was capped, though, so salespeople did not receive a commission on lenses sold above a ceiling amount. Firms often use ceilings to avoid paying "windfall" commissions that might result when a new product is introduced that proves very popular and sales rise sharply even without much effort from the firms' salespeople. A firm might also increase a salesperson's quota if he or she consistently exceeds it. Raising output quotas is sometimes called "ratcheting."

Peathegee Inc/Tetra Images, LLC/Alamy Stock Photo

A contact lens manufacturer increased its profit by taking the advice of economists to compensate its salespeople with a straight commission on sales.

Misra and Nair discovered that the firm's compensation plan was inefficient. Salespeople appeared to work harder just before the end of a calendar quarter in order to satisfy their sales quotas. They also appeared to reduce their effort once they had met their quotas. The researchers found that salespeople were often reluctant to exceed their quotas for fear the firm would increase—ratchet up—their quota in future quarters.

To reduce these inefficiencies, Misra and Nair recommended that the firm eliminate the sales quotas and compensation ceilings and move to a compensation plan that consisted of a straight commission on sales. The firm accepted the recommendation, and after implementing the new plan, sales increased by more than 20 percent, or nearly $80,000 per salesperson per quarter. The higher compensation under the new plan succeeded in increasing the sales force's effort. The increase in the firm's revenue more than offset the increase in its compensation cost, resulting in a 6 percent increase in the firm's profit.

Sociologists sometimes question whether worker productivity can be increased through the use of monetary incentives. The experience of this contact lens firm provides a clear example of workers reacting favorably to the opportunity to increase work effort in exchange for higher compensation. As Stanford economist Edward Lazear has put it: "Compensation, incentives, and productivity are inseparably linked."

Your Turn: Test your understanding by doing related problems 5.5, 5.6, and 5.7 at the end of this chapter.

Other Considerations in Setting Compensation Systems

The discussion so far has indicated that companies will find it more profitable to use a commission or piece-rate system of compensation than to use a salary system. In fact, many firms continue to pay their workers salaries, which means they are paying their workers on the basis of how long they work rather than on the basis of how much they produce. Firms may choose a salary system for several good reasons:

- **Difficulty measuring output.** Often firms have difficulty attributing output to any particular worker. For example, an engineering firm may carry out a project using teams of workers whose individual contributions are difficult to distinguish. On assembly lines, such as those used in the automobile industry, the amount produced by each worker is determined by the speed of the line, which is set by managers rather than by workers. Managers at many firms perform such a wide variety of tasks that measuring their output would be costly, if it could be done at all.
- **Concerns about quality.** If workers are paid on the basis of the number of units produced, they may become less concerned about quality. An office assistant who is paid on the basis of the quantity of documents prepared may become careless about how many errors the documents contain. In some cases, there are ways around this problem; for example, the assistant may be required to correct the mistakes on his or her own time, without pay.
- **Worker dislike of risk.** Piece-rate or commission systems of compensation increase the risk to workers because sometimes output declines for reasons not connected to the worker's effort. For example, if there is a very snowy winter, few customers may show up at Anne's auto dealership. Through no fault of their own, her salespeople may have great difficulty selling any cars. If they are paid a salary, their income will not be affected, but if they are on commission, their incomes may drop to low levels. The flip side of this is that by paying salaries, Anne assumes a greater risk. During a snowy winter, her payroll expenses will remain high even though her sales are low. With a commission system of compensation, her payroll expenses will decline along with her sales. But owners of firms are typically better able to bear risk than are workers. As a result, some firms may find that workers who would earn more under a commission system will prefer to receive a salary to reduce their risk. In these situations, paying a lower salary may reduce the firm's payroll expenses compared with what they would have been under a commission or piece-rate system.

Personnel economics is a relatively new field, but it holds great potential for helping firms deal more efficiently with human resources issues.

16.6 The Markets for Capital and Natural Resources

LEARNING OBJECTIVE: Show how equilibrium prices are determined in the markets for capital and natural resources.

The approach we have used to analyze the market for labor can also be used to analyze the markets for other factors of production. We have seen that the demand for labor is determined by the value of the marginal product of labor because the value to a firm of hiring another worker equals the increase in the firm's revenue from selling the additional output it can produce by hiring the worker. The demand for capital and the demand for natural resources are determined in a similar way.

The Market for Capital

Physical capital includes robots, computers, and buildings. Firms sometimes buy capital, but we will focus on situations in which firms rent capital. A chocolate manufacturer renting a warehouse and an airline leasing a plane are examples of firms renting capital. Like the demand for labor, the demand for capital is a derived demand. When a firm is considering increasing its capital by, for example, employing another robot, the value it receives equals the increase in the firm's revenue from selling the additional output it can produce by employing the robot. The *value of the marginal product of capital* is the change in the firm's revenue as a result of employing one more unit of capital. We have seen that the value of the marginal product of labor curve is the demand curve for labor. Similarly, the value of the marginal product of capital curve is the demand curve for capital.

Firms producing capital goods face increasing marginal costs, so the supply curve of capital goods is upward sloping. Figure 16.11 shows equilibrium in the market for capital. In equilibrium, suppliers of capital receive a rental price equal to the value of the marginal product of capital, just as suppliers of labor receive a wage equal to the value of the marginal product of labor.

The Market for Natural Resources

The market for natural resources can be analyzed in the same way as the markets for labor and capital. When a firm is considering employing more natural resources, the value it receives equals the increase in the firm's revenue from selling the additional output it can produce by buying the natural resources. So, the demand for natural resources is also a derived demand. The *value of the marginal product of natural resources* is the change in a firm's revenue as a result of employing one more unit of natural resources, such as a barrel of oil. The value of the marginal product of natural resources curve is also the demand curve for natural resources.

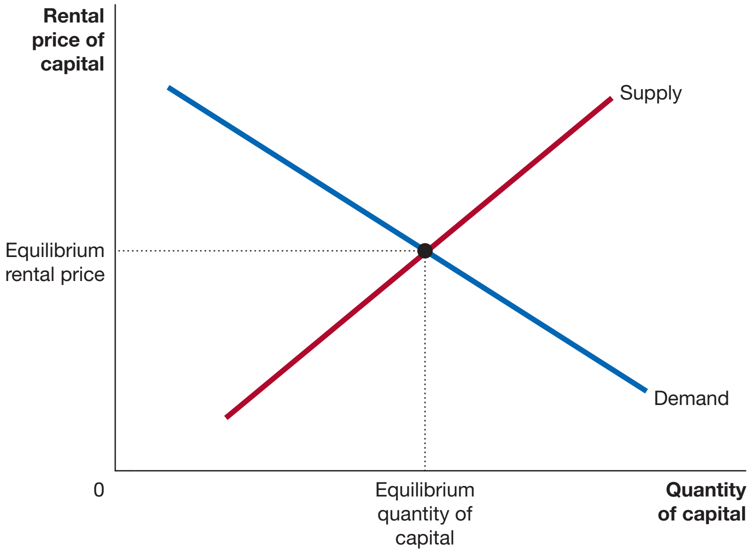
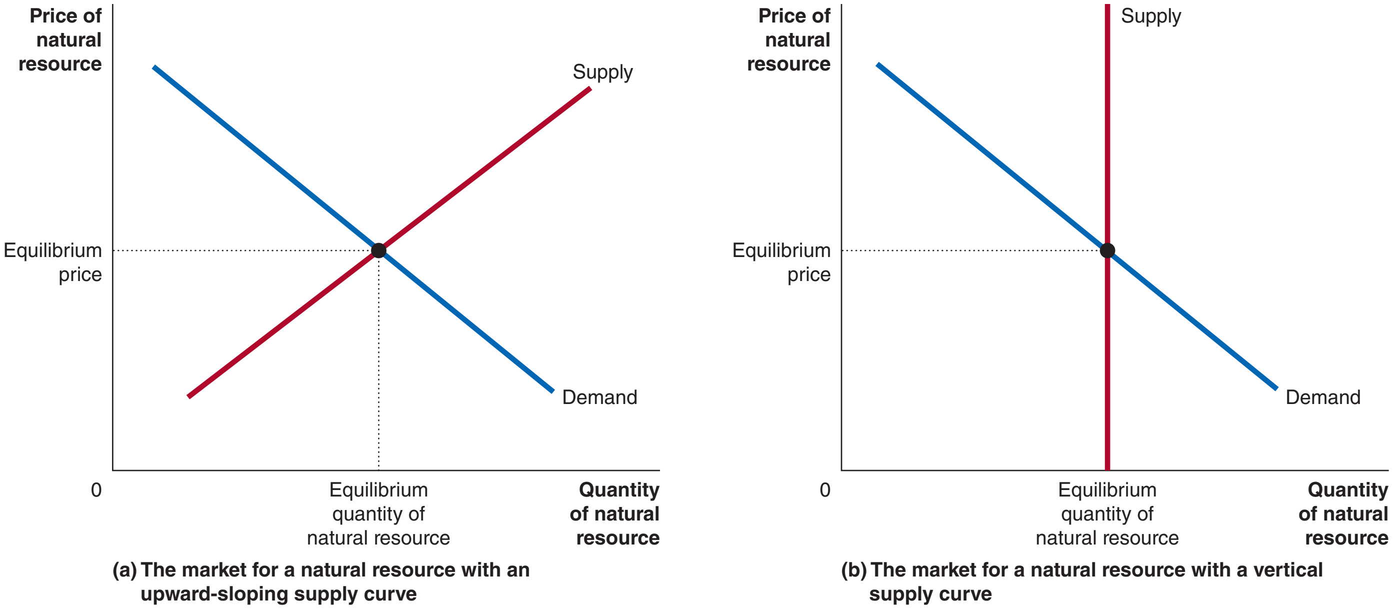


Figure 16.11

Equilibrium in the Market for Capital

The rental price of capital is determined by demand and supply in the market for capital. In equilibrium, the rental price of capital is equal to the value of the marginal product of capital.



(a) The market for a natural resource with an upward-sloping supply curve

(b) The market for a natural resource with a vertical supply curve

Figure 16.12 **Equilibrium in the Market for Natural Resources**

In panel (a), the supply curve of a natural resource is upward sloping. The price of the natural resource is determined by the interaction of demand and supply. In panel (b), the supply curve of the natural resource is a vertical line, indicating that the quantity supplied does not respond to changes in price. In this case, the price of the natural resource is determined only by demand. The price of a factor of production with a vertical supply curve is called *economic rent*, or *pure rent*.

Although the total quantity of most natural resources is ultimately fixed—as the humorist Will Rogers once remarked: "Buy land. They ain't making any more of it"—in many cases, the quantity supplied still responds to price. For example, although the total quantity of oil deposits in the world is fixed, an increase in the price of oil will result in an increase in the quantity of oil supplied during a particular period. The result, as shown in panel (a) of Figure 16.12, is an upward-sloping supply curve. In some cases, however, the quantity of a natural resource that will be supplied is fixed and will not change as the price changes. The land available at a busy intersection is fixed, for example. In panel (b) of Figure 16.12, we illustrate this situation with a supply curve that is a vertical line, or perfectly inelastic. The owner of a factor of production that is in fixed supply receives an **economic rent** (or **pure rent**). In this case, the price of the factor is determined only by demand. For example, if a new highway diverts much of the traffic from a previously busy intersection, the demand for the land will decline, and the price of the land will fall, but the quantity of the land will not change.

Economic rent (or **pure rent**) The price of a factor of production that is in fixed supply.

Monopsony

We have analyzed the case of *monopoly*, where a firm is the sole *seller* of a good or service (see Chapter 15). What happens if a firm is the sole *buyer* of a factor of production? This case, which is called **monopsony**, is comparatively rare. An example is a firm in an isolated town—perhaps a lumber mill in a small town in Washington or Oregon—that is the sole employer of labor in that location. In the nineteenth and early twentieth centuries, some coal mining firms were the sole employers in certain small towns in West Virginia, and some large pineapple farms were the sole employers on certain small islands in Hawaii. In these cases, the firm would own not only the mill, mine, or farm but also the stores and other businesses in the town. Workers would have the choice of working for the sole employer in the town or moving to another town.

Monopsony The situation in which a firm is the sole buyer of a factor of production.

We know that a firm with a monopoly in an output market takes advantage of its market power to reduce the quantity supplied to force up the market price and increase its profit. A firm that has a monopsony in a factor market would employ a similar strategy: It would restrict the quantity of the factor demanded to force down the price of the factor and increase profit. A firm with a monopsony in a labor market will hire fewer workers and pay lower wages than would be the case in a competitive market. Because fewer workers are hired than would be hired in a competitive market, monopsony results in a deadweight loss. Monopoly and monopsony have similar effects on the economy: In both cases, a firm's market power results in a lower equilibrium quantity, a deadweight loss, and a reduction in economic efficiency compared with a competitive market.

In some cases, monopsony in labor markets is offset by worker membership in a labor union. A notable example of this is professional sports. For instance, Major League Baseball (MLB) effectively has a monopsony on employing professional baseball players. (Although independent baseball leagues exist, none of the best players play for these teams, and the teams pay salaries that are a small fraction of those paid by MLB teams.) The monopsony power of the owners of MLB teams is offset by the power of the Major League Baseball Players Association, the union that represents baseball players. This situation is sometimes called *bilateral monopoly* because both the buyer (MLB) and the seller (the players' union) have a monopoly. Bargaining between the representatives of MLB and the players' union has resulted in baseball players being paid something close to what they would be receiving in a competitive market.

Some economists argue that monopsony power is a factor in reducing wages for some U.S. workers if exercised either directly or indirectly through agreements among firms not to compete for workers or by firms requiring workers to agree not to work for a competing firm. Eric Posner of the University of Chicago Law School and the late Alan Krueger of Princeton University estimated that between 15 and 20 percent of workers in the United States are covered by noncompete agreements. Traditionally, a firm used noncompete agreements to keep workers who had received extensive training at the firm or who had knowledge of the firm's trade secrets from leaving to work for a competitor. In recent years, though, some firms have required even low-skilled, low-wage workers to sign noncompete agreements. Between 1987 and 2017, McDonald's required their franchisees—who own and operate many McDonald's restaurants—to sign "no-poaching" agreements, under which they would agree not to try to hire away workers from other McDonald's restaurants.

The Department of Justice and the Federal Trade Commission (FTC) have ruled that noncompete agreements without valid business reasons violate antitrust laws. (An example of a valid business reason is protecting trade secrets.) In recent years, firms such as Apple, Google, and Intel have paid substantial legal settlements to former employees who were forced to sign noncompete agreements as a condition of employment. McDonald's and some other fast-food companies no longer require franchisees to sign no-poaching agreements. These developments may indicate that fewer firms are using anti-competitive labor market strategies. To reinforce these trends, in 2021, President Biden signed an executive order intended to further restrict the ability of firms to use noncompete agreements. In January 2023, the FTC proposed a new rule that would ban most noncompete clauses in employment contracts. As of late 2023, it wasn't yet clear whether the rule would go into force.

Apply the Concept

Monopsony Power and Antitrust Policy

As we saw in Chapter 15, Section 15.6, the U.S. Department of Justice's Antitrust Division and the FTC are responsible for enforcing the federal government's antitrust laws. Generally, these agencies focus on *horizontal mergers* between two firms in the same industry. The agencies' main concern is the effect of two firms combining on the merged firms' market power in the *output market*. For example, if two book publishers merge, how will that affect the price of books? But what if the newly merged firm gains increased market power in *input markets* and uses that power to force its suppliers to accept lower prices? For example, if two book publishers merge, will they be able to use their market power to reduce the royalties they pay to writers? The federal antitrust authorities have traditionally considered market power in the output market—which is called *monopoly power*—but rarely considered market power in the input market—which is called *monopsony power*.

A pure monopsony that is the sole buyer of an input is a rare situation. It's also rare to have a monopoly in an output market in which a single firm is the sole seller of a good. But many firms have some monopoly power because they have the ability to charge a price higher than marginal cost. Similarly, although monopsonies in input markets are rare, some firms may have monopsony power because they have the ability to pay less than the competitive equilibrium price for an input. For example, Walmart is large enough in the market for some products, such as detergent and toothpaste, that it can pressure suppliers for discounts that lower the purchasing price below the competitive price.

Monopsony power was a key consideration in November 2021, when the Justice Department filed an antitrust lawsuit to keep the book publisher Penguin Random House from buying Simon & Schuster. These are two of the five largest book publishers in the world. The merged firm would have accounted for 31 percent of books published in the U.S. market. The lawsuit contended that buying Simon & Schuster would allow "Penguin Random House, which is already the largest book publisher in the world, to exert outsized influence over which books are published in the United States and how much authors are paid for their work."

Michael Reynolds/EPA-EFE/Shutterstock

Author Steven King arriving to testify in the antitrust suit challenging the proposed merger between Penguin and Simon & Schuster.

We saw in Chapter 15, Section 15.6 that when two large firms propose a merger, they often argue that the merger will allow efficiency gains large enough to result in lower prices despite the merged firm having increased monopoly power. In August 2022, during the antitrust trial over the merger of Penguin and Simon & Schuster, Markus Dohle, who was then the CEO of Penguin, made a similar argument, but his argument was about an input market—the market for book manuscripts, particularly those written by prominent authors. He argued that because Penguin had a much better distribution network, sales of Simon & Schuster books would increase, which would lead to increased payments to authors. Authors would be made better off by the merger, even though the newly merged firm would have greater monopsony power. Penguin's attorneys also argued that the market for book publishing was larger than the Justice Department believed. They argued that the relevant book market included not just the five largest publishers but also included Amazon and many medium and small publishers "all capable of competing for [the right to publish] future titles from established and emerging authors."

The CEO of Hachette Book Group, another large book publisher, disagreed, arguing at the trial that the merger between Penguin and Simon & Schuster would result in lower payments to authors. Best-selling novelist Stephen King testified for the government, stating his belief that "consolidation is bad for competition." King argued that because of previous consolidations in the publishing industry, payments to authors had declined, and "it becomes tougher and tougher for writers to find enough money to live on."

The antitrust lawsuit against Penguin and Simon & Schuster was an example of the more aggressive antitrust policy being pursued by the Biden administration that we discussed in the *Apply the Concept* "Should the Federal Government Take a More Forceful Approach to Antitrust Policy?" in Chapter 15, Section 15.6. An article in the *New York Times* quoted a lawyer specializing in antitrust cases as arguing that the lawsuit against Penguin and Simon & Schuster was unusual in that the lawsuit "declines to even allege the historically key antitrust harm—increased prices." On November 1, 2022, the federal court judge hearing the case ruled in favor of the Justice Department: "The Court finds that the United States has shown that the effect of the proposed merger may be substantially to lessen competition in the market for the U.S. publishing rights to anticipated top-selling books." Although Penguin planned to appeal the ruling, Paramount Global, the owners of Simon & Schuster, decided instead to pull out of its agreement with Penguin, ending the possibility of a merger.

Your Turn: Test your understanding by doing related problem 6.9 at the end of this chapter.

The Marginal Productivity Theory of Income Distribution

We have seen that in equilibrium, each factor of production receives a price equal to its value of marginal product. We can use this fact to explain the distribution of income. The value of the marginal product of a factor represents the value of the factor's marginal contribution to producing goods and services. Therefore, individuals will receive income equal to the marginal contributions to production from the factors of production they own, including their labor. The more factors of production an individual owns and the more productive those factors are, the higher the individual's income will be. This approach to explaining the distribution of income is called the **marginal productivity theory of income distribution**. The theory was developed by John Bates Clark, who taught at Columbia University from 1895 to 1923.

Marginal productivity theory of income distribution The theory that the distribution of income is determined by the marginal productivity of the factors of production that individuals own.

Continued from chapter opener

Economics in Your Life & Career

When Should You Give an Employee a Raise?

At the beginning of this chapter, we asked you to suppose that you own a local sandwich shop and that one of your employees asks you for a raise.

One way for you to measure the value of an employee is by estimating how many dollars her work generates for the sandwich shop: the value of her marginal product of labor. If the employee has become better at her job and has gained new skills, she may have become a more productive employee. A key to your decision about whether to grant the employee a raise is whether this increased productivity has resulted in increased revenue for your sandwich shop. If it has, then you will probably have to raise her wage or see her quit to take a job at a competing business.

Conclusion

In this chapter, we used the demand and supply model to explain why wages differ among workers. The demand for workers depends on their productivity and on the prices firms receive for the output the workers produce. The supply of workers to an occupation depends on the wages and working conditions employers offer and the skills they require. The demand and supply for labor can also help us analyze issues such as economic discrimination and the effect of labor unions.

CHAPTER SUMMARY AND PROBLEMS

Key Terms

Compensating differential, p. 572
Derived demand, p. 556
Economic discrimination, p. 572
Economic rent (or pure rent), p. 582
Factors of production, p. 556
Human capital, p. 559
Labor union, p. 577
Marginal product of labor, p. 556
Marginal productivity theory of income distribution, p. 585
Monopsony, p. 582
Personnel economics, p. 578
Statistical discrimination, p. 577
Value of the marginal product of labor (*VMPL*), p. 557

16.1 The Demand for Labor

LEARNING OBJECTIVE: Explain how firms choose the profit-maximizing quantity of labor to employ.

Summary

Factors of production are labor, capital, natural resources, and other inputs used to make goods and services. The demand for labor is a **derived demand** because it depends on consumers' demand for goods and services. The additional output produced by a firm as a result of hiring another worker is called the **marginal product of labor**. The amount by which a firm's revenue will increase as a result of hiring one more worker is called the **value of the marginal product of labor (*VMPL*)**. A firm's *VMPL* curve is its demand curve for labor. Firms maximize profit by hiring workers up to the point where the wage is equal to the *VMPL*. We find the market demand curve for labor by adding up the quantity of labor demanded by each firm at each wage, holding constant all other variables that might affect the willingness of firms to hire workers. The most important variables that shift the labor demand curve are changes in human capital, technology, the price of the product, the quantity of other inputs, and the number of firms in the market. **Human capital** is the accumulated training and skills that workers possess.

Review Questions

1.1 In what sense is the demand for labor a derived demand?
1.2 What is the difference between the marginal product of labor and the value of the marginal product of labor?
1.3 Why is the demand curve for labor downward sloping?
1.4 What are the five most important variables that cause the market demand curve for labor to shift?

Problems and Applications

1.5 Frank Gunter owns an apple orchard. He employs 87 apple pickers and pays them each $8 per hour to pick apples, which he sells for $1.60 per box. If Frank is maximizing profit, what is the value of the marginal product of the last worker he hired? What is that worker's marginal product? Briefly explain your reasoning.

1.6 [Related to Solved Problem 16.1] Fill in the missing values in the following table for Terrell's Televisions and then answer the questions.

Number of Workers (*L*)	Output of Televisions per Week (*Q*)	Marginal Product of Labor (television sets per week) (*MP*)	Product Price (*P*)	Value of the Marginal Product of Labor (*VMPL*) (dollars per week)	Wage (dollars per week) (*W*)	Additional Profit from Hiring One More Worker (dollars per week)
0	0		$300		$1,800	
1	8		300		1,800	
2	15		300		1,800	
3	21		300		1,800	
4	26		300		1,800	
5	30		300		1,800	
6	33		300		1,800	

a. From the information in the table, can you determine whether this firm is a price taker or a price maker? Briefly explain.
b. Use the information in the table to draw a graph like Figure 16.1 that shows the demand for labor by this firm. Be sure to indicate the profit-maximizing quantity of labor on your graph.

1.7 State whether each of the following events will result in a movement along the market demand curve for labor in electronics factories in China or whether it will cause the market demand curve for labor to shift. If the demand curve shifts, indicate whether it will shift to the left or to the right and draw a graph to illustrate the shift.
a. The wage rate declines.
b. The price of smartphones declines.
c. Several firms exit the smartphone market in China.
d. Chinese high schools introduce new vocational courses in assembling electronic products.

1.8 [Related to the Apply the Concept "What Is the Economic Payoff for Free Community College?"] Suppose that 20 years from now, the fraction of workers with only a high school degree declines, while the fraction of workers with an associate's degree from a community college increases.

What would you expect this development to have on the demand curve for labor? Are you certain about your response? If not, what other information would you need to increase your confidence in your response?

1.9 Two sports writers calculated that over the course of his 20-year career in the National Basketball Association, Tyson Chandler had a cumulative value of –$89 million to the 8 teams he played for. How could a basketball player have *negative* value to a basketball team?

1.10 **[Related to the Economics in Your Life & Career]** In 2023, the minimum wage in San Francisco was $18.07 per hour. Restaurants with more than 20 employees were also required to provide employees with health insurance, paid sick leave, and paid parental leave. In response, some restaurants hired fewer workers and asked customers to pick up their meals from a counter and bus their own dirty dishes. As a news article put it: "Restaurants haven't developed a way to serve meals with less labor. They've gotten customers to do the labor they had been paying employees to do." One restaurant owner was quoted as saying that to hire workers to perform these tasks, "a $10 hamburger would be a $20 hamburger, and it wouldn't make sense anymore."

a. What does the restaurant owner mean by saying that a $20 hamburger "wouldn't make sense"?

b. From the information given, what can we conclude about the value of the marginal product of the servers in these restaurants relative to the compensation—wages plus health insurance plus paid sick and parental leave—they would receive?

c. Who gains and who loses from the city regulations, as described in this news article, that set the wages and other compensation firms in San Francisco are required to pay?

16.2 The Supply of Labor

LEARNING OBJECTIVE: Explain how people choose the quantity of labor to supply.

Summary

As the wage increases, the opportunity cost of leisure increases, causing individuals to supply a greater quantity of labor. Normally, the labor supply curve is upward sloping, but it is possible that at very high wage levels, the supply curve might become backward bending. This outcome occurs when someone with a high income is willing to accept a somewhat lower income in exchange for more leisure. We find the market labor supply curve by adding up the quantity of labor supplied by each worker at each wage, holding constant all other variables that might affect the willingness of workers to supply labor. The most important variables that shift the labor supply curve are increases in population, changing demographics, and changing alternatives.

Review Questions

2.1 How can we measure the opportunity cost of leisure? What are the substitution effect and the income effect resulting from a wage change? Why is the supply curve of labor usually upward sloping?

2.2 What are the three most important variables that cause the market supply curve of labor to shift?

Problems and Applications

2.3 An article in the *Wall Street Journal* reported on research by Dain Lee, Jinhyeok Park, and Yongseok Shin of Washington University in St. Louis, which showed that "the top-earning 10% of men in the U.S. labor market logged 77 fewer work hours in 2022, on average, than those in the same earnings group in 2019. . . . Over the same three-year period, the top-earning 10% of women cut back time at work by 29 hours." What can we conclude about the shapes of the supply curves for labor of these high-earning men and women? Is it more likely that a high-earning person's labor supply curve would have this shape than would the labor supply curve of a lower-earning person? Briefly explain.

2.4 Daniel was earning $65 per hour and working 45 hours per week. Then Daniel's wage rose to $75 per hour, and as a result, he now works 40 hours per week. What can we conclude from this information about the income effect and the substitution effect of a wage change for Daniel?

2.5 Consider these two articles in the *Wall Street Journal*, which discuss employee attitudes toward overtime:

(1) The first article describes the situation at Weifield Group Contracting, a firm based in Centennial, Colorado, that installs electrical systems. When the firm had trouble hiring enough new workers, managers asked many existing workers to work overtime—which means working more than 40 hours per week. Federal law requires firms to pay wages for overtime work that are at least 50 percent more than the regular hourly wage rate. The firm's CEO was quoted as saying, "There are some guys that will not work overtime. You can't pay 'em enough to work overtime." For these workers, what can we say about the size of the income effect of a wage change relative to the size of the substitution effect?

(2) The second article describes a cook at a banquet hall who often works around 60 hours per week: "The extra pay on top of her hourly rate of $15.10 has made it easier for [her] . . . to move into her own apartment and cover her bills." What can we say about the size of the income effect of a wage change relative to the size of the substitution effect for this worker?

2.6 Suppose that a large oil field is discovered in Michigan. By imposing a tax on the oil, the state government is able to eliminate the state income tax on wages. What is likely to be the effect on the labor supply curve in Michigan? Briefly explain.

2.7 According to an estimate by the Census Bureau, the number of people between the ages of 18 and 64 will increase by 27 million.

a. Holding other factors constant, briefly explain the effect this increase will have on the labor supply curve in the United States.

b. The Census notes that "there are three demographic reasons why populations change." What are those three reasons?

2.8 State whether each of the following events will result in a movement along the market supply curve of agricultural labor in the United States or whether it will cause the market supply curve of agricultural labor to shift. If the supply curve shifts, indicate whether it will shift to the left or to the right and draw a graph to illustrate the shift.

a. The agricultural wage rate declines.
b. Wages outside agriculture increase.
c. The law is changed to allow for unlimited immigration into the United States.

16.3 Equilibrium in the Labor Market

LEARNING OBJECTIVE: Explain how equilibrium wages are determined in labor markets.

Summary

The intersection between labor supply and labor demand determines the equilibrium wage and the equilibrium level of employment. If labor supply is unchanged, an increase in labor demand will increase both the equilibrium wage and the number of workers employed. If labor demand is unchanged, an increase in labor supply will lower the equilibrium wage and increase the number of workers employed.

Review Questions

3.1 If the labor demand curve shifts to the left and the labor supply curve remains unchanged, what will happen to the equilibrium wage and the equilibrium level of employment? Illustrate your answer with a graph.

3.2 If the labor supply curve shifts to the left and the labor demand curve remains unchanged, what will happen to the equilibrium wage and the equilibrium level of employment? Illustrate your answer with a graph.

Problems and Applications

3.3 An article in the *Wall Street Journal* described changes in the technology sector of the U.S. economy:

> The percentage of retirees in the U.S. population has climbed sharply over the past decade . . . with millions of baby boomers leaving the workforce. Declining immigration has added to shortages, particularly in tech . . . and other fields that depend heavily on foreign-born employees. . . . These forces have led to a giant shock to the workforce. "I don't think we've seen a talent transition of this magnitude [since] World War II," said Ana Kreacic, chief operating officer of Oliver Wyman Forum.

The same article explains that some companies removed prequalifications, such as a college degree or work experience in the sector, and that some people who considered themselves blue-collar workers before the pandemic started taking certification courses for technology jobs.

a. Based on this information, draw and label a graph that shows the demand curve and the supply curve in the market for labor in the tech sector of the U.S. economy. Referring to your graph, describe how the increase in the number of workers retiring and the decline in immigration affect the equilibrium wage and the equilibrium number of workers hired in this market.

b. How is the market for labor in the tech sector affected when workers enroll in courses and acquire other credentials to prepare themselves for employment in tech jobs?

3.4 According to research by David Autor of the Massachusetts Institute of Technology, and Arindrajit Dube and Annie McGrew of the University of Massachusetts, between January 2020 and September 2022, the wages of workers in all educational categories increased. At the same time, there was a decrease in the gap between the wages of workers with college degrees and the wages of workers with only high school degrees or who didn't graduate from high school.

a. What does this information tell you about how much the demand for workers with high school degrees or who didn't graduate from high school has shifted relative to how much the supply of these workers has shifted? Draw a graph to illustrate your answer. Be sure your graph shows the shifts in the labor demand and labor supply curves and any changes in the equilibrium wage and the equilibrium quantity of workers hired.

b. Would you expect the size of the gap in wages between college graduates and high school graduates to increase or decrease over time? What information would help to increase your confidence in your answer?

3.5 According to a columnist in the *Wall Street Journal*, "The fact that smart, ambitious children who attend elite colleges also do well in life doesn't mean the first caused the second."

a. Briefly discuss what evidence exists to support this statement.

b. If students don't increase their earnings later in life by attending a highly selective college rather than a less selective college, why do they (and their parents) go to so much effort to gain admission to a highly selective college?

3.6 Sean Astin, who played the hobbit Sam in *The Lord of the Rings* movies, wrote the following about an earlier film he had appeared in: "Now I was in a movie I didn't respect, making obscene amounts of money (five times what a teacher makes, and teachers do infinitely more important work)." Are salaries determined by the importance of the work being done? If not, what are salaries determined by?

3.7 In a survey of members of the American Economic Association, 64 percent of the economists who responded disagreed with the following statement: "Easing restrictions on immigration will depress the average wage rate in the United States." If these economists are correct that the average wage rate won't fall if the level of immigration increases, what must be true of the effect of increased immigration on the demand and supply of labor in the United States? Draw a graph to illustrate your answer. Be sure your graph shows any shifts in the labor demand and labor supply curves and any changes in the equilibrium wage and the equilibrium quantity of workers hired.

3.8 In the Immigration Act of 1990, Congress established the H-1B visa program, intended to allow U.S. firms to hire foreign workers in areas such as the physical sciences, computer programing, and engineering. John Bound of the University of Michigan, Nicolas Morales of the Federal Reserve Bank of Richmond, and Gaurav Khanna of the University of California, San Diego, studied the effects of the H-1B program on the market for computer science (CS) workers in the United States in the years from 1994 to 2001, during which the Internet first became important for the operations of U.S. firms. They found that the visa program may have had effects on labor demand in two ways: (1) if immigrant CS workers were responsible for innovations, such as improving the functioning of websites, that required more CS workers to be hired, and (2) if U.S. firms hiring immigrant CS workers reduced the likelihood that the firms would have hired foreign technology firms to carry out CS work. The researchers noted, "If computer scientists are a sufficient spur to innovation, or if domestic employers can readily offshore CS work, any negative effects that an increase in the number of foreign CS workers might have on the domestic high-skill workforce would be offset by increases in the domestic demand for computer scientists."
   a. Draw a demand and supply graph of the market for CS workers in the United States to illustrate the authors' argument. Be sure to indicate on your graph any effects of the H-1B visa program on the demand and supply curves.
   b. The authors estimate that the H-1B visa program resulted in a reduction of about 4 percent in the wages U.S. CS workers would otherwise have received. Does this conclusion allow you to determine whether the program had a greater effect on labor demand or on labor supply? Briefly explain.

3.9 **[Related to the Apply the Concept "Will You Compete with Robots and Chatbots for a Job—Or Work with Them?"]** A report from an economic policy organization concludes, "Yes, automation has led to job displacements in particular occupations and industries in the past, but there is no basis for claiming that automation has led—or will lead—to increased joblessness, unemployment, or wage stagnation overall."
   a. What does the report mean by "automation"?
   b. If automation has led to job losses in some occupations and industries, how can it not have resulted in a reduction in the total number of jobs available in the economy?

3.10 **[Related to the Apply the Concept "Will You Compete with Robots and Chatbots for a Job—Or Work with Them?"]** Economist Michael Strain argues that "generative AI [such as ChatGPT] has the potential to affect large swaths of the economy—like electricity and the steam engine before it. . . . [But] we must remember that creative destruction does not only destroy. It also creates, often in powerful and unexpected ways."
   a. What does Strain mean by "creative destruction"? (*Hint*: You may want to review the discussion in Chapter 15, Section 15.4.)
   b. Which sectors of the economy is generative AI like ChatGPT likely to affect the most? Which sectors is it likely to affect the least? Briefly explain.

3.11 **[Related to the Chapter Opener]** In an opinion column in the *Wall Street Journal*, Greg Ip wrote: "Automation has been displacing labor continuously for centuries, of course, but historically took its toll on routine, repetitive work. Generative AI by contrast hits well-paid college-educated professionals right in their human capital."
   a. What do you think Ip means by "routine, repetitive work"? Give an example of this type of work being carried out by machinery rather than by workers.
   b. Why might generative AI, like ChatGPT, be more likely to affect well-paid, college-educated professionals than people doing routine, repetitive work?

16.4 Explaining Differences in Wages

LEARNING OBJECTIVE: Use demand and supply analysis to explain how compensating differentials, discrimination, and labor unions cause wages to differ.

Summary

The equilibrium wage is determined by the intersection of the labor demand curve and the labor supply curve. Some differences in wages are explained by **compensating differentials**, which are higher wages that compensate workers for unpleasant aspects of a job. Wages can also differ because of **economic discrimination**, which involves paying a person a lower wage or excluding a person from an occupation on the basis of irrelevant characteristics, such as race or gender. Some employers practice **statistical discrimination**, which is the practice of assigning the characteristics of a group to an individual who belongs to the group. A **labor union** is an organization of employees that has the legal right to bargain with employers about wages and working conditions. Being in a union increases a worker's wages about 10 percent, holding constant other factors, such as the industry the workers are in.

Review Questions

4.1 What is a compensating differential? Give an example.

4.2 Define *economic discrimination*. Is the fact that one group in the population has higher earnings than other groups evidence of economic discrimination? Briefly explain.

4.3 What is statistical discrimination? Why might some employers engage in statistical discrimination?

4.4 In what sense do employers who discriminate pay an economic penalty? Is this penalty enough to eliminate discrimination? Briefly explain.

Problems and Applications

4.5 According to a report from Northwestern University's Medill School of Journalism, 2,500 newspapers closed between 2005 and 2022. During the same period, employment at newspapers declined by 70 percent. Can we be certain that the wages of journalists have declined since 2005? What other information would we need to be sure? Illustrate your answer with a labor demand and labor supply graph, showing the circumstances necessary for the equilibrium wage for journalists to have increased and the circumstances necessary for the equilibrium wage to have decreased.

4.6 **[Related to the Don't Let This Happen to You]** Joe Morgan was a sportscaster and former baseball player. After he stated that he thought the salaries of Major League Baseball players were justified, a baseball fan wrote the following to Rob Neyer, a sports columnist:

> Mr. Neyer,
>
> What are your feelings about Joe Morgan's comment that players are justified in being paid what they're being paid? How is it ok for A-Rod [Alex Rodriguez, at the time a player on the New York Yankees] to earn $115,000 per GAME while my boss works 80 hour weeks and earns $30,000 per year?

How would you answer this fan's questions?

4.7 Through the 2022 season, Nick Saban's record as the head football coach at the University of Alabama was 183 wins and 25 losses. The $11.7 million salary the university paid him in 2023 was the highest received by any college sports coach, as well as the highest paid to any public employee in the country. Yet long-time sports announcer Dan Patrick said that despite the high salary, "Saban might be the best bargain in sports right now." In what sense might a college football coach be a bargain for his university despite the university paying him a high salary?

4.8 **[Related to the Apply the Concept "Technology and the Earnings of 'Superstars'"]** An article in the *Wall Street Journal* discussed the large amounts that music companies are willing to pay in contracts with some hip-hop or rap artists. According to the article, these large contracts are "driven almost entirely by the rise of streaming services" such as Spotify and Apple Music. But the article also notes that "for many acts, it's still tough to get a record deal." Why is the financial payoff from streaming concentrated among a relatively few artists? Shouldn't streaming make it easier for all artists to get recording contracts?

4.9 **[Related to the Apply the Concept "Technology and the Earnings of 'Superstars'"]** Why are there superstar basketball players but no superstar plumbers?

4.10 The following table is based on data collected by the Bureau of Labor Statistics. There are wide differences in the median wages of the occupations listed—for example, between air traffic controllers and broadcast announcers. (Half the workers in an occupation earn more than the median wage, and half earn less.) But there are also significant variations in wages within occupations. The worker at the tenth percentile earns a wage higher than 10 percent of the workers in that occupation. The worker at the ninetieth percentile earns a wage higher than 90 percent of the workers in that occupation. For each of the following occupations, provide one reason large variations exist between the tenth and ninetieth percentile wages:

a. Broadcast announcers and radio disc jockeys
b. Real estate brokers
c. Economists
d. Veterinarians

Occupation	Median Wage	10th Percentile Wage	90th Percentile Wage
Accountants and auditors	$78,000	$48,560	$132,690
Air traffic controllers	$132,250	$73,590	$189,800
Broadcast announcers and radio disc jockeys	$41,750	$23,920	$171,650
Economists	$113,940	$62,480	$207,230
Epidemiologists	$78,520	$51,170	$123,430
Paralegals and legal assistants	$59,200	$37,690	$94,960
Physicists	$142,850	$75,760	$219,760
Real estate brokers	$52,030	$29,880	$123,830
Registered nurses	$81,220	$61,250	$129,400
Veterinarians	$103,260	$62,350	$174,500

4.11 Sam Goldwyn, a movie producer during Hollywood's Golden Age in the 1930s and 1940s, once remarked about one of his stars: "We're overpaying him, but he's worth it."

a. In what sense did Goldwyn mean that he was overpaying this star?
b. If he was overpaying the star, why would the star have still been worth it?

4.12 Prior to the early twentieth century, a worker who was injured on the job could collect damages only by suing his employer. To sue successfully, the worker—or his family, if the worker had been killed—had to show that the injury was due to the employer's negligence, that the worker did not know the job was hazardous, and that the worker's own negligence had not contributed to the accident. These lawsuits were difficult for workers to win, and even workers who had been seriously injured on the job often were unable to collect any damages from their employers. Beginning in 1910, most states passed workers' compensation laws that required employers to purchase insurance that would compensate workers for injuries suffered on the job. A study by Price Fishback of the University of Arizona and Shawn Kantor of Florida State University, shows that after the passage of workers' compensation laws, wages received by workers in the coal and lumber industries fell. Briefly explain why passage of workers' compensation laws would lead to a decrease in wages in some industries.

4.13 The following table is similar to Table 16.2, except that it includes the earnings of Asian men and women.

a. Does the fact that Asian men and Asian women are the two highest-earning groups in the table affect the likelihood that economic discrimination is the best explanation for why earnings differ among the groups listed in the table? Briefly explain your argument.

b. What other information might be useful to you in assessing the extent to which economic discrimination accounts for the differences in earnings among these groups?

Group	Weekly Earnings
Asian men	$1,617
Asian women	1,310
White men	1,201
White women	1,016
Black men	975
Hispanic or Latino men	892
Black women	877
Hispanic or Latino women	788

4.14 During the 1970s, many women changed their minds about whether they would leave the labor force after marrying and having children or whether they would be in the labor force most of their adult lives. In 1968, the National Longitudinal Survey asked a representative sample of women aged 14 to 24 whether they expected to be in the labor force at age 35. Twenty-nine percent of white women and 59 percent of Black women responded that they expected to be in the labor force at that age. In fact, when these women were 35 years old, 60 percent of those who were married and 80 percent of those who were unmarried were in the labor force. In other words, many more women ended up being in the labor force than expected to be when they were of high school and college age. What effect did this fact have on the earnings of these women? Briefly explain.

4.15 Lawrence Katz, an economist at Harvard, was quoted in a newspaper article as arguing that differences between the incomes of male physicians and female physicians "are largely explained by individual choices." He also noted that discrimination could account for part of the gap, "though it isn't clear how much."

a. What did Katz mean by "individual choices"? How can individual choices result in differences in how much men and women are paid?

b. Why is it difficult to estimate how much of the gap between what men and women are paid is due to discrimination?

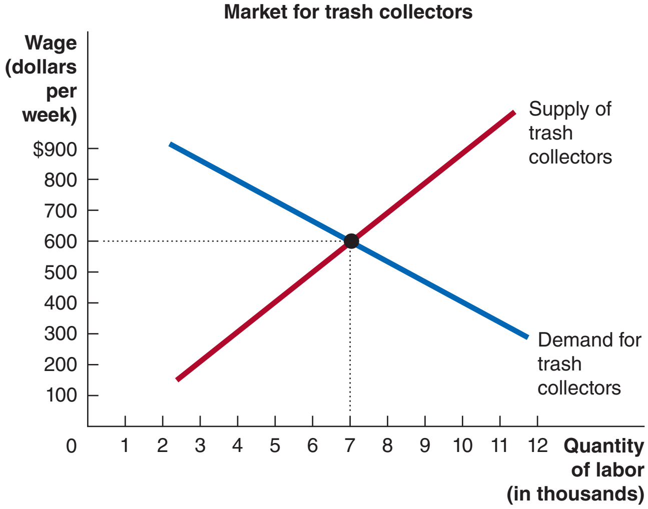
4.16 Claudia Goldin of Harvard University, Sari Pekkala Kerr of Wellesley College, and Claudia Olivetti of Dartmouth College stated in a research paper that when college-educated women begin their careers, they earn about the same as male colleagues. If the women have children, the researchers said, "gender differences in earnings widen for some time after a birth." They noted that some of the gap is related to human capital: By staying home or working part time while their children are young, mothers end up with less experience and less time spent working, on average, than do men of the same age. But the researchers also noted that some of the earning gap could be due to:

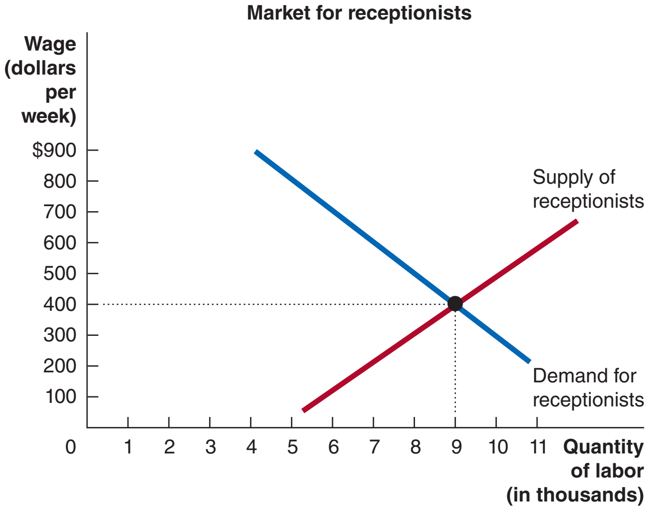
> . . . both overt and unintentional discrimination by employers, managers, and supervisors. Mothers could be deliberately and discriminatorily passed over for promotions, or their direct supervisors could be guilty of a form of paternalism that serves to protect the individual but actually harms them.

a. What do these researchers mean when they speak of a woman worker's manager engaging in "paternalism"? Why might the manager believe that paternalism might protect the woman worker? Why might it actually harm the worker?

b. These researchers attributed part of the gender earnings gap between women who are mothers and men to human capital reasons. Does that part of the gap also represent economic discrimination? Briefly explain.

4.17 **[Related to Solved Problem 16.4]** Use the following graphs to answer the questions.





a. What is the equilibrium quantity of trash collectors hired, and what is the equilibrium wage?

b. What is the equilibrium quantity of receptionists hired, and what is the equilibrium wage?

c. Briefly discuss why trash collectors might earn a higher weekly wage than receptionists.

d. Suppose that comparable-worth legislation is passed, and the government requires that trash collectors and receptionists be paid the same wage, $500 per week. Now how many trash collectors will be hired, and how many receptionists will be hired?

4.18 **[Related to Solved Problem 16.4]** In most universities, economics professors receive higher salaries than English professors. Suppose that the government requires that from now on, all universities must pay economics professors the same salaries as English professors. Use demand and supply graphs to analyze the effect of this requirement.

4.19 **[Related to the Apply the Concept "Does Greg Have an Easier Time Finding a Job Than Jamal?"]** Why might employers be more likely to interview a job applicant with a white-sounding name than an applicant with an African American–sounding name? Leaving aside legal penalties, will employers that follow this practice incur an economic penalty? Briefly explain.

4.20 **[Related to the Apply the Concept "Does Greg Have an Easier Time Finding a Job Than Jamal?"]** Many firms include on their employment applications a box that job seekers are asked to check if they have ever been convicted of a crime. Some firms automatically reject applicants who check the box. As a result, some people with criminal convictions have difficulty finding a job, which may increase the likelihood that they will commit another crime. Some states and cities have enacted "ban the box" legislation that forbids firms from asking about criminal histories on job applications, although typically the firms are allowed to ask such questions in job interviews. A study by Jennifer L. Doleac of Texas A&M University and Benjamin Hansen of the University of Oregon found that ban-the-box legislation significantly reduces the probability of employment among young male African American job applicants. The economists noted that ban-the-box legislation "does not address employers' concerns about hiring those with criminal records, and so could increase discrimination against groups that are more likely to include recently-incarcerated ex-offenders." Briefly explain why this result might have occurred. Relate your answer to the reasons firms might be more likely to interview an applicant with a white-sounding name even if the applicant's résumé is identical to that of an applicant with a Black-sounding name.

4.21 Daniel Hamermesh, an economist at the University of Texas, has done a great deal of research on labor markets. In a book, Hamermesh wrote that "there is a penalty to earnings for bad looks and a premium for good looks." According to his statistical estimates, "the bottom 15 percent of women by looks . . . received 4 percent lower pay than average-looking women. The top one-third of women by looks . . . received 8 percent more than average-lookers. For men, the comparable figures are a 13 percent penalty and a 4 percent premium." Is it likely that these differences in earnings are due to economic discrimination? Briefly explain.

16.5 Personnel Economics

LEARNING OBJECTIVE: Discuss the role personnel economics can play in helping firms deal with human resources issues.

Summary

Personnel economics is the application of economic analysis to human resources issues. One insight of personnel economics is that the productivity of workers can often be increased if firms move from straight-time pay to commission or piece-rate pay.

Review Questions

5.1 What is personnel economics?

5.2 What are the two ways that the productivity of a firm's employees may increase when a firm moves from straight-time pay to commission or piece-rate pay? If piece-rate or commission systems of compensating workers have important advantages for firms, why don't more firms use them?

Problems and Applications

5.3 In 2018, Frito-Lay changed the compensation of drivers of trucks delivering Doritos, Cheetos, and other snacks to convenience stores and supermarkets. Previously, drivers' compensation depended primarily on commissions tied to the revenue from the snacks they delivered. Frito-Lay shifted to drivers receiving a straight salary with few opportunities to earn commissions. Some drivers in New York and other cities had their compensation cut by as much as 30 percent. A significant number of drivers quit, leading to temporary shortages of Doritos in some stores. A Frito-Lay spokesman was quoted as saying, "This is a national initiative with the aim of aligning all sales associates. Participating sales representatives have on average seen an increase in overall compensation."

a. What are the advantages and disadvantages to drivers from the change in Frito-Lay's compensation scheme?

b. What are the advantages and disadvantages to Frito-Lay from the change in its compensation scheme?

5.4 Research by economists Susan Helper of Case Western Reserve University, Morris Kleiner of the University of Minnesota, and Yingchun Wang of the University of Houston found that the use of pay-for-performance, or piece-rate pay, has declined in manufacturing industries in recent decades. They conclude that this result is caused by firms adopting "'modern manufacturing' in which firms produce a greater variety of products to a more demanding quality and delivery standard."

a. What characteristics determine whether a salary system or a piece-rate system is likely to be more profitable for a manufacturing firm?

b. Why would modern systems "in which firms produce a greater variety of products to a more demanding quality and delivery standard" than manufacturers used previously result in firms choosing to pay their workers salaries rather than use piece rates?

5.5 [**Related to the Apply the Concept "A Better Way to Sell Contact Lenses"**] In discussing "output-based compensation schemes," such as piece-rate systems, the late Stanford economist Edward Lazear observed, "One major advantage of this approach is that it accommodates a variety of worker preferences." But he also noted, "A disadvantage is that a pure piece-rate scheme makes the worker bear risk associated with variations in . . . business conditions."

a. What did Lazear mean by the first quote above? How do these compensation schemes accommodate different worker preferences? Preferences for what?

b. What did Lazear mean by the second quote above? What are "business conditions"? How do they affect worker compensation when a firm is using a piece-rate scheme?

5.6 [**Related to the Apply the Concept "A Better Way to Sell Contact Lenses"**] For years, the Goodyear Tire & Rubber Company compensated its sales force by paying a salesperson a salary plus a bonus, based on the number of tires he or she sold. Eventually, Goodyear made two changes to this policy: (1) The basis for the bonus was changed from the *quantity* of tires sold to the *revenue* from the tires sold; and (2) salespeople were required to get approval from corporate headquarters in Akron, Ohio, before offering to sell tires to customers at reduced prices. Explain why these changes were likely to increase Goodyear's profits.

5.7 [**Related to the Apply the Concept "A Better Way to Sell Contact Lenses"**] When the contact lens firm discussed in the *Apply the Concept* feature implemented a new compensation plan, who benefited from the change? Is it likely that there were any losers from the change? Briefly explain.

16.6 The Markets for Capital and Natural Resources

LEARNING OBJECTIVE: Show how equilibrium prices are determined in the markets for capital and natural resources.

Summary

The approach used to analyze the market for labor can also be used to analyze the markets for other factors of production. In equilibrium, the price of capital is equal to the value of the marginal product of capital, and the price of natural resources is equal to the value of the marginal product of natural resources. The price received by a factor that is in fixed supply is called an **economic rent** (or **pure rent**). A **monopsony** is a situation in which a firm is the sole buyer of a factor of production. According to the **marginal productivity theory of income distribution**, the distribution of income is determined by the marginal productivity of the factors of production individuals own.

Review Questions

6.1 In equilibrium, what determines the price of capital? What determines the price of natural resources? What is an economic rent?

6.2 What is a monopsony?

6.3 What is the marginal productivity theory of income distribution?

Problems and Applications

6.4 Adam operates a pin factory. Suppose that Adam faces the situation shown in the following table and that the cost of renting a machine is $550 per week.

a. Fill in the missing values in the table and determine the profit-maximizing number of machines for Adam to rent. Briefly explain why renting this number of machines is profit maximizing.

b. Draw Adam's demand curve for capital.

Number of Machines	Output of Pins (boxes per week)	Marginal Product of Capital	Product Price (dollars per box)	Total Revenue	Value of the Marginal Product of Capital	Rental Cost per Machine	Additional Profit from Renting One Additional Machine
0	0	—	$100		—	$550	
1	12		100			550	
2	21		100			550	
3	28		100			550	
4	34		100			550	
5	39		100			550	
6	43		100			550	

6.5 Many people have predicted, using a model like the one in panel (b) of Figure 16.12, that the price of natural resources should rise consistently over time in comparison with the prices of other goods because the demand curve for natural resources is continually shifting to the right, while the supply curve must be shifting to the left as natural resources are used up. However, the relative prices of most natural resources have not been increasing. Draw a graph showing the demand and supply for natural resources that can explain why prices haven't risen even though demand has.

6.6 In 1879, economist Henry George published *Progress and Poverty*, which became one of the best-selling books of the nineteenth century. In this book, George argued that all existing taxes should be replaced with a single tax on land. Tax incidence refers to the actual division of the burden of a tax between buyers and sellers in a market (see Chapter 4, Section 4.4). What is the incidence of a land tax? That is, if land is taxed, how will the burden of the tax be divided between the sellers of land and the buyers of land? Illustrate your answer with a graph of the market for land.

6.7 WeWork buys or rents office space and converts it to shared space that it then rents to individuals and firms. According to an article in the *Wall Street Journal*, until it agreed to stop doing so as part of a court settlement, WeWork "required 'nearly all' employees, including baristas and receptionists, to sign agreements barring them from working at similar businesses for a year after leaving WeWork."

- **a.** What benefit did WeWork receive from requiring its employees to sign such agreements?
- **b.** Were there any benefits to employees as a result of signing the agreements? If not, why would they have signed them?

6.8 In a competitive labor market, imposing a minimum wage should reduce the equilibrium level of employment. Will this result definitely still hold if the labor market is a monopsony? Briefly explain.

6.9 **[Related to the Apply the Concept "Monopsony Power and Antitrust Policy"]** A column in the *Wall Street Journal* notes that to understand FTC antitrust policy, "we have to look at an unusual word the FTC has used of late: 'monopsony.'" The column discusses the difference between a firm having monopoly power and having monopsony power.

- **a.** Briefly explain the difference between monopoly power and monopsony power.
- **b.** The FTC was established in 1914. Why then would this columnist think that the word "monopsony" might be considered unusual by readers of the *Wall Street Journal* in connection with FTC policy?

Critical Thinking Exercises

CT16.1 The National Collegiate Athletic Association (NCAA) consists of colleges and universities and manages college sports. In 2021, the NCAA authorized college athletes to participate in the name, image, and likeness (NIL) market. In the past, the NCAA had allowed college athletes to accept payment of tuition and fees by their college or university but had banned them from receiving any other payments for playing sports. Note that professional athletes often earn millions of dollars a year, so the difference in earnings between college and professional athletes was vast, despite the popularity and revenue of college sports. The NCAA Men's Division 1 Basketball Tournament TV contract, for example, earns the NCAA about $1 billion a year.

In the NIL market, student athletes can receive payments for activities such as endorsing products, posting on social media, appearing at events, having their likeness used in video games, and teaching at sports training camps. While their institutions and alumni supporters still cannot directly pay college athletes, in the NIL market, college athletes can potentially earn substantial amounts. According to media reports, college athletes earned about $1 billion in the NIL market in 2022.

Do you think that a college athlete would be paid the value of his or her marginal revenue product in the NIL market?

CT16.2 If you follow professional sports, you likely know that many leagues, such as the National Football League, have salary caps for teams. That is, the amount a team can pay its players is limited. Why might leagues adopt salary caps? (*Hint*: Consider how this chapter explains the pay of professional athletes.)

17

Public Choice, Taxes, and the Distribution of Income

The Continuing Political Debate over Taxes

W.Scott McGill/123RF

Taxes are usually an issue in presidential elections. Reports from the Congressional Budget Office (CBO) often provide context for the debate over taxes. Congress created the CBO to provide it with impartial economic analysis as it makes decisions about the federal government's budget. When the federal government spends more than it collects in tax revenue, the government runs a *budget deficit*. To fund the deficit, the U.S. Treasury borrows by issuing Treasury bonds that investors, pension funds, U.S. financial firms, and foreign central banks purchase. The total value of Treasury bonds issued over the years is called the *federal government debt* or the *national debt*.

In July 2023, the CBO issued a forecast of the federal government's spending and tax revenues in future years. The forecast showed that through 2033, spending would increase faster than tax revenues, resulting in debt rising to record levels. Such a large government debt could make it more difficult for households and firms to borrow and would cause the federal government's interest payments on the debt to greatly increase, making it more difficult for the government to fund other types of spending.

Both political parties proposed reducing forecast deficits through some combination of spending reductions and tax increases. But the parties could not agree on which spending to cut and which taxes to increase. Economists and policymakers often focus on two aspects of taxes: (1) Taxes reduce the efficiency of the economy, and (2) taxes affect the distribution of income. An ideal tax would reduce economic efficiency the least and would decrease, rather than increase, income inequality. With some taxes—but not all taxes—there is a trade-off between these two objectives: A tax that reduces economic efficiency the least may increase income inequality, while a tax that reduces income inequality may also significantly reduce economic efficiency. A further complication is that some tax changes that increase income inequality in the short run may decrease it in the long run.

In 2023, President Joe Biden proposed reducing the budget deficit by, among other changes to the tax code, raising the top corporate tax rate from 21 percent to 28 percent and raising the top personal income tax rate from 37 percent to 39.6 percent. In testimony before Congress, Treasury Secretary Janet Yellen said that the administration favored "requiring corporations and the wealthiest to pay their fair share" of taxes. Republicans, including several candidates in the 2024 presidential election, favored reducing the budget deficit by reducing federal spending and reducing or eliminating some federal tax credits, including those for people buying electric vehicles.

The debate over tax policy during the 2024 presidential election wasn't unusual. When Presidents John F. Kennedy and Ronald Reagan proposed significant cuts in income taxes that they argued would increase economic efficiency, critics claimed that the tax cuts rewarded taxpayers with high incomes and increased income inequality. Although the basic purpose of taxes is to pay for the government's spending, over the years, Congress and the president have used taxes to try to achieve other policy objectives. For example, Congress has used tax breaks to promote home ownership, employer-provided medical insurance, and solar power.

Understanding the tax system and the criteria economists use to evaluate tax proposals is important in analyzing the role of the government in the economy. Here are some of the questions we consider in this chapter: Has the tax code increased or reduced economic efficiency? Has government policy had much effect on the distribution of income? If not, what explains trends in income inequality?

Chapter Outline & Learning Objectives

17.1 Public Choice, page 598
Describe the public choice model and use it to analyze government decision making.

17.2 The Tax System, page 602
Explain the tax system in the United States, including the principles that governments use to create tax policy.

17.3 Tax Incidence Revisited: The Effect of Price Elasticity, page 611
Explain the effect of price elasticity on tax incidence.

17.4 Income Distribution and Poverty, page 614
Discuss income distribution and income mobility and the role of policy in addressing these issues.

Economics in Your Life & Career

Which Is Better: A $1,000 Raise or $1,000 toward Health Insurance?

Suppose you own a bike shop with 15 employees. You have trouble retaining employees because competing bike shops are paying higher wages. You think increasing your employees' compensation by $1,000 per year would make working at your bike shop more attractive. One employee requests that instead of increasing her wage by $1,000, you reduce by that amount the premium she pays for the health insurance plan you offer employees. Why would she make that request? Wouldn't anyone prefer to have $1,000 in cash rather than $1,000 contributed to a health insurance plan? As you read this chapter, try to answer this question. You can check your answer against the one we provide at the end of this chapter.

We have seen that the government plays a significant role in helping the market system work efficiently by providing secure rights to private property and an independent court system to enforce contracts (see Chapter 2, Section 2.3). We have also seen that the government itself must sometimes supply goods—known as *public goods*—that private firms will not supply (see Chapter 5, Section 5.4). But how do governments decide which policies to adopt? Nobel Laureate James Buchanan and Gordon Tullock of George Mason University, along with other economists, developed the **public choice model**, which applies economic analysis to government decision making. In the next section, we will explore how this model can help us understand how policymakers make decisions.

Public choice model A model that applies economic analysis to government decision making.

In Sections 17.2 and 17.3, we will discuss the principles that governments use to create tax policy. In particular, we will see how economists identify which taxes are most economically efficient. At the end of this chapter, we will discuss the extent to which government policy—including tax policy—affects the distribution of income.

17.1 Public Choice

LEARNING OBJECTIVE: Describe the public choice model and use it to analyze government decision making.

In earlier chapters, we explained the decisions of households and firms by assuming that they act to make themselves as well off as possible. In particular, we have assumed that households choose the goods they buy to maximize their utility and that firms choose the quantities and prices of the goods they sell to maximize profit. Because government policy plays an important role in the economy, we need to consider how government policymakers—such as senators, governors, presidents, and state legislators—arrive at their decisions. One of the key insights from the public choice model is that policymakers are no different from consumers or managers of firms: A policymaker is likely to pursue his or her own self-interest, even if it conflicts with the public interest. In particular, we expect that public officials will take actions that are likely to result in their reelection.

How Do We Know the Public Interest? Models of Voting

It is possible to argue that elected officials simply represent the preferences of the voters who elect them. After all, it would seem logical that voters will not reelect a politician who fails to act in the public interest. A closer look at voting, however, makes it less clear that politicians are simply representing the views of the voters.

The Voting Paradox Many policy decisions involve multiple alternatives. Consider, for instance, the trade-offs members of Congress face because the size of the federal budget is limited. To take a simple example, suppose that there is $1 billion available in the budget, and Congress must choose whether to spend it on *only one* of three alternatives: (1) research on breast cancer, (2) subsidies for mass transit, or (3) increased pandemic preparedness. Assume that the votes of members of Congress will represent the preferences of their constituents. We might expect that Congress will vote for the alternative favored by a majority of voters. In fact, though, there are circumstances in which majority voting will fail to result in a consistent decision. For example, suppose for simplicity that there are only three voters, and they have the preferences shown at the top of Table 17.1.

At the top of the table, we list the three voters in the first column. The remaining columns show the voters' rankings of the alternatives. For example, Lena would prefer to see the money spent on cancer research. Her second choice is mass transit, and her third choice is pandemic preparedness. What happens if a series of votes are taken in which each pair of alternatives is considered in turn? The bottom of Table 17.1 shows the results of these votes. If the vote is between spending the money on cancer research and spending the money on mass transit, cancer research wins because Lena and David

Table 17.1

The Voting Paradox

Voter	First Choice	Second Choice	Third Choice
Lena	Cancer research	Mass transit	Pandemic preparedness
David	Pandemic preparedness	Cancer research	Mass transit
Kathleen	Mass transit	Pandemic preparedness	Cancer research

Vote	Outcome
Cancer research versus mass transit	Cancer research wins
Mass transit versus pandemic preparedness	Mass transit wins
Pandemic preparedness versus cancer research	Pandemic preparedness wins

both prefer spending the money on cancer research rather than on mass transit. So, if the votes of members of Congress represent the preferences of voters, we have a clear verdict, and the money is spent on breast cancer research. Suppose, though, that the vote is between spending the money on mass transit and spending the money on pandemic preparedness. Then, because Lena and Kathleen prefer spending on mass transit to spending on pandemic preparedness, mass transit wins. Now, finally, suppose the vote is between spending on cancer research and spending on pandemic preparedness. Surprisingly, pandemic preparedness wins because that is what David and Kathleen prefer. The outcome of this vote is surprising because if voters prefer cancer research to mass transit and mass transit to pandemic preparedness, we would expect that consistency in decision making would ensure that they prefer cancer research to pandemic preparedness. But in this example, the collective preferences of the voters turn out not to be consistent. The failure of majority voting to always result in consistent choices is called the **voting paradox**.

Voting paradox The failure of majority voting to always result in consistent choices.

This example is artificial because we assumed that there were only three alternatives, there were only three voters, and a simple majority vote determined the outcomes. In fact, though, the late Nobel Laureate Kenneth Arrow of Stanford University demonstrated mathematically that the failure of majority votes to always represent voters' preferences is a very general result. The **Arrow impossibility theorem** states that no system of voting can be devised that will consistently represent the underlying preferences of voters. In other words, there is no way through democratic voting to ensure that the preferences of voters are translated into policy choices. In fact, the Arrow impossibility theorem indicates that voting might lead to shifts in policy that may not be efficient. For instance, which of the three alternatives for spending the $1 billion Congress will actually choose would depend on the order in which the alternatives happen to be voted on, which might change from one year to the next. So, for economic issues, such as the funding of public goods, we cannot count on the political process to necessarily result in an efficient outcome. In other words, the "voting market"—as represented by elections—may often do a less efficient job of representing consumer preferences than do markets for goods and services.

Arrow impossibility theorem A mathematical theorem that holds that no system of voting can be devised that will consistently represent the underlying preferences of voters.

The Median Voter Theorem In practice, many political issues are decided by a majority vote. In those cases, what can we say about which voters' preferences the outcome is likely to represent? The **median voter theorem** states that the outcome of a majority vote is likely to represent the preferences of the voter who is in the political middle. Figure 17.1 shows another simple example with five voters and their preferences for spending on breast cancer research. Their preferences range from Kathleen, who prefers to spend nothing on breast cancer research—preferring to spend the funds on other programs or for federal spending to be reduced and taxes lowered—to Lena, who prefers to spend $6 billion.

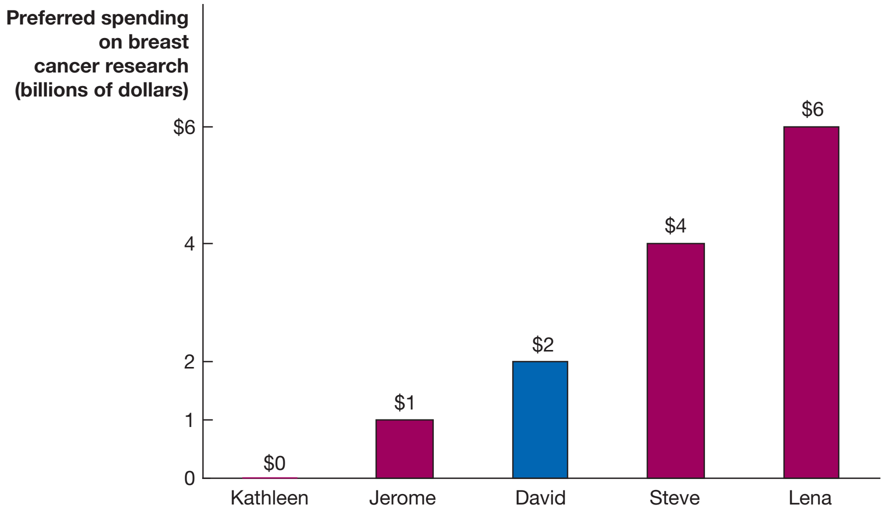
Median voter theorem The proposition that the outcome of a majority vote is likely to represent the preferences of the voter who is in the political middle.

In this case, David is the median voter because he is in the political middle; two voters would prefer to spend less than he does, and two voters would prefer to spend more than he does. To see why the median voter's preferences are likely to prevail, consider

Figure 17.1

The Median Voter Theorem

The median voter theorem states that the outcome of a majority vote is likely to represent the preferences of the voter who is in the political middle. In this case, David is in the political middle because two voters want to spend more on breast cancer research than he does, and two voters want to spend less. In any vote between a proposal to spend $2 billion and a proposal to spend a different amount, a proposal to spend $2 billion will win.



first a vote between David's preferred outcome of spending $2 billion and a proposal to spend $6 billion. Because only Lena favors spending $6 billion and the other voters all prefer spending less, the proposal to spend $2 billion would win four votes to one. Similarly, consider a vote between spending $2 billion and spending $1 billion. Three voters prefer spending more than $1 billion, and only two prefer spending $1 billion or less, so the proposal to spend $2 billion will win three votes to two. Only the proposal to spend $2 billion will have the support of a majority when paired with proposals to spend a different amount. Notice also that the amount spent as a result of the voting is less than the amount that would result from taking the simple average of the voter's preferences, which would be $2.6 billion.

One implication of the median voter theorem is that the political process tends to serve people whose preferences are in the middle but not people whose preferences are far away from the middle. There is an important contrast between the political process, which results in collective actions in which everyone is obliged to participate, and the market process, in which individuals are free to participate or not. For instance, even though Kathleen would prefer not to spend government funds on breast cancer research, once a majority has voted to spend $2 billion, she is obliged to go along with the spending—and the taxes required to fund the spending. This outcome is in contrast with the market for goods and services, where if, for instance, Kathleen disagrees with the majority of consumers who like iPhones, she is under no obligation to buy one. Similarly, even though Lena and Steve might prefer to pay significantly higher taxes to fund additional spending on breast cancer research, they are obliged to go along with the lower level of spending that the majority approved. If Lena would like to have her iPhone gold plated, she can choose to do so with her own funds, even if the vast majority of consumers would consider such spending a waste of money.

Government Failure?

The voting models we have just considered indicate that individuals are less likely to see their preferences represented in the outcomes of government policies than in the outcomes of markets. The public choice model goes beyond this observation to question whether the self-interest of policymakers is likely to cause them to take actions that are inconsistent with the preferences of voters, even where those preferences are clear. In the next sections, we examine several key concepts that help explain this outcome.

Rent seeking Attempts by individuals and firms to use government action to make themselves better off at the expense of others.

Rent Seeking Economists usually focus on the actions of individuals and firms as they attempt to make themselves better off by interacting in markets. The public choice model shifts the focus to attempts by individuals and firms to engage in **rent seeking**, which is the use of government action to make themselves better off at the expense of others. One of the benefits of the market system is that it channels self-interested behavior in a way that benefits society as a whole. Although Apple developed the iPhone to make a profit, its actions increased the well-being of millions of consumers. When Samsung introduced the Galaxy to compete with the iPhone, it was also motivated by the desire for profit, but it further increased consumer well-being by expanding the choice of smartphones available to consumers. Rent seeking, in contrast, can benefit a few individuals or firms at the expense of all other individuals and firms. For example, U.S. sugar firms have successfully convinced Congress to impose a quota on imports of sugar (see Chapter 9, Section 9.4). The quota has benefited the owners of U.S. sugar firms and the people who work for them but has reduced consumer surplus, hurt U.S. candy companies and their workers, and reduced economic efficiency.

Because firms can benefit from government intervention in the economy, as the sugar companies have benefited from the sugar quota, they are willing to spend money to influence government policymakers. Members of Congress, state legislators, governors, and presidents need funds to finance their election campaigns. So, these policymakers may accept campaign contributions from rent-seeking firms and may be willing to introduce *special-interest legislation* on their behalf.

Logrolling and Rational Ignorance Two other factors help explain why rent-seeking behavior can sometimes succeed. It may seem puzzling that the sugar quota has been enacted when it helps very few workers and firms. Why would members of Congress vote for the sugar quota if they do not have sugar producers in their districts? One possibility is *logrolling*, which refers to the situation in which a member of Congress votes to approve a bill in exchange for favorable votes from other members on other bills. For example, a member of Congress from Texas might vote for the sugar quota, even though none of the member's constituents will benefit from it. In exchange, members of Congress from districts where sugar producers are located will vote for legislation the member of Congress from Texas would like to see passed. As former Pennsylvania Senator Pat Toomey put it after his attempt to eliminate the sugar quota was voted down: "They circle the wagons, work together, protect each others' interests." This *vote trading* may result in a majority of Congress supporting legislation that benefits the economic interests of a few while harming the economic interests of a much larger group.

But if the majority of voters are harmed by rent-seeking legislation, how does it get passed, even given the effects of logrolling? Consider an additional factor that explains the survival of the sugar quota. Although total consumer surplus declines by $4.92 billion per year because of the sugar quota, when it is spread across a population of 335 million, the loss per person is only about $15 per year. Because the loss is so small, most people do not take it into account when deciding who to vote for, and many people are not even aware that the sugar quota exists. Other voters may be convinced to support restrictions on trade because the jobs saved by tariffs and quotas are visible and often highly publicized, while the jobs lost because of these restrictions and the reductions in consumer surplus receive less notice. Because becoming informed on an issue may require time and effort and the economic payoff is often low, some economists argue that many voters are *rationally ignorant* of the effect of rent-seeking legislation. In this view, because voters frequently lack an economic incentive to become informed about legislation, the preferences of voters do not act as a constraint on legislators voting for rent-seeking legislation.

Regulatory Capture One way the government intervenes in the economy is by establishing a regulatory agency or commission that is given authority over a particular industry or type of product. For example, no firm is allowed to sell prescription drugs in the United States without first receiving authorization from the Food and Drug Administration (FDA). Ideally, regulatory agencies will make decisions in the public interest. The FDA should weigh the benefits to patients from quickly approving a new drug against the costs of a drug with potentially dangerous side effects being approved without thorough testing. However, because the firms being regulated have a financial stake in the regulatory agency's actions, the firms have an incentive to try to influence those actions. In extreme cases, this influence may lead the agency to make decisions that are in the best interests of the firms being regulated, even if these actions are not in the public interest. In that case, the agency has been subject to *regulatory capture* by the industry being regulated. Some economists point to the Interstate Commerce Commission (ICC) as an example of regulatory capture. Although Congress has since abolished the ICC, for decades it determined the prices that railroads and long-distance trucking firms could charge to haul freight. Congress originally established the ICC to safeguard the interests of consumers, but some economists have argued that for many years the ICC operated to suppress competition, which was in the interests of the railroads and trucking firms rather than in the interests of consumers. Economists debate the extent to which regulatory capture explains the decisions of some government agencies.

The presence of externalities can lead to market failure, which is the situation in which the market does not supply the economically efficient quantity of a good or service (see Chapter 5, Section 5.1). Public choice analysis indicates that *government failure* can also occur. For the reasons we have discussed in this section, it is possible that government intervention in the economy may reduce economic efficiency rather than increase it. Economists disagree about the extent to which government failure results in serious economic inefficiency in the U.S. economy. Most economists, though, accept the basic argument of the public choice model that policymakers may have incentives to intervene in the economy in ways that do not promote efficiency and that proposals for such intervention should be evaluated with care.

Is Government Regulation Necessary?

The public choice model raises important questions about the effect of government regulation on economic efficiency. Can we conclude that Congress should abolish agencies such as the Food and Drug Administration (FDA), the Environmental Protection Agency (EPA), and the Federal Trade Commission (FTC)? In fact, most economists agree that these agencies can serve useful purposes. For instance, the EPA can help oversee laws passed by Congress that correct the effect of externalities, such as the pollution that some companies emit as they produce goods. Regulatory agencies can also improve economic efficiency in markets where consumers have difficulty obtaining the information they need to make informed purchases. For example, consumers have no easy way of detecting bacteria and other contaminants in food or determining whether prescription drugs are safe and effective. The FDA was established in 1906 to monitor the nation's food supply following newspaper accounts of unsanitary practices in many meatpacking plants.

Although government regulation can clearly provide important benefits to consumers, we need to take into account the costs of regulations. Recent estimates indicate that the costs of federal regulations may be several thousand dollars per taxpayer. Economics can help policymakers devise regulations that provide benefits to consumers that exceed their costs.

17.2 The Tax System

LEARNING OBJECTIVE: Explain the tax system in the United States, including the principles that governments use to create tax policy.

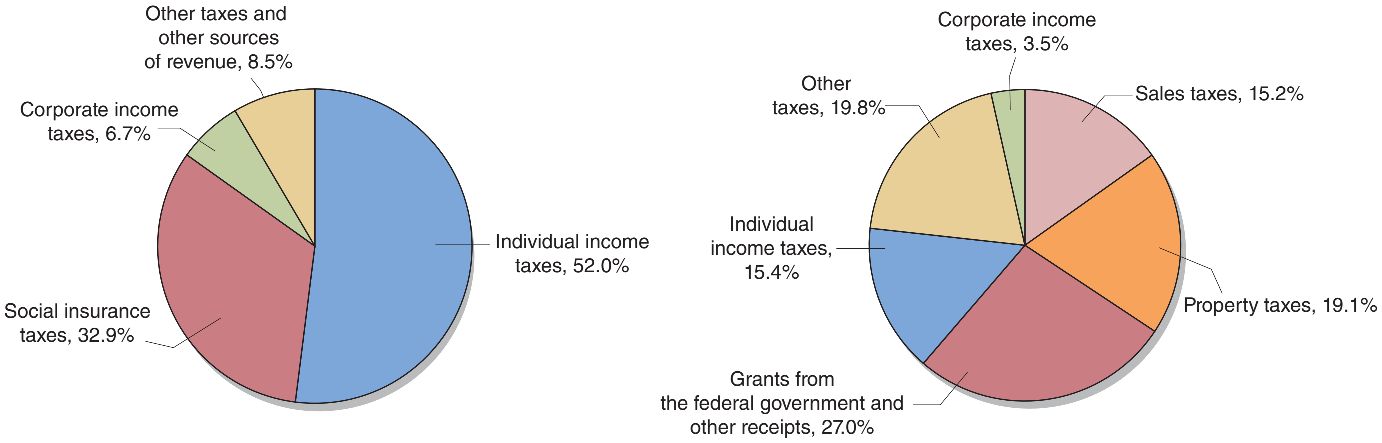
The government primarily relies on taxes to raise revenue. Some taxes, such as those on cigarettes or alcohol, are intended to both raise revenue and discourage what society views as undesirable behavior. These are the most widely used taxes:

- **Individual income taxes.** The federal government, most state governments, and some local governments tax the wages, salaries, and other income of households. The profits of some small businesses are also taxed at the same rate as wages and salaries, while, following passage of the Tax Cuts and Jobs Act of 2017, the profits of other small businesses are taxed at a lower rate. The individual income tax is the largest source of revenue for the federal government. Over the decades, Congress has changed the tax code in ways that have reduced the number of households with low income that pay federal individual income taxes. In fact, in recent years, nearly half of all households paid no federal income tax.

- **Social insurance taxes.** The federal government taxes wages and salaries to raise revenue for the Social Security and Medicare programs. *Social Security* makes payments to retired workers and to disabled individuals. *Medicare* helps pay the medical expenses of people over age 65. The Social Security and Medicare taxes are often called *payroll taxes*. As the U.S. population has aged, payroll taxes have increased. In 2022, more than two-thirds of taxpayers paid a greater amount in payroll taxes than in federal individual income taxes. The federal government and state governments also tax wages and salaries to raise revenue for the unemployment insurance system, which makes payments to workers who have lost their jobs.
- **Sales taxes.** Most state and local governments tax retail sales of most products. More than half the states exempt groceries from the sales tax, and a few states also exempt clothing.
- **Property taxes.** Most local governments tax homes, offices, factories, and the land they are built on. In the United States, the property tax is the largest source of funds for public schools.
- **Excise taxes.** The federal government and some state governments levy excise taxes on specific goods, such as gasoline, cigarettes, and beer.

An Overview of the U.S. Tax System

Panels (a) and (b) of Figure 17.2 show the revenue sources of the federal, state, and local governments. Panel (a) shows that the federal government raises about 85 percent of its revenue from social insurance taxes and individual income taxes. Corporate income taxes



Tax	Amount (billions)	Amount per Household	Percentage of Total Tax Receipts
Individual income taxes	$2,614	$19,921	52.0%
Social insurance taxes	1,653	12,596	32.9
Other taxes and other sources of revenue	426	3,248	8.5
Corporate income taxes	335	2,553	6.7
Total	$5,027	$38,319	100.0%

(a) Sources of federal government revenue, 2022

Tax	Amount (billions)	Amount per Household	Percentage of Total Tax Receipts
Grants from the federal government and other receipts	$952	$7,255	27.0%
Other taxes	697	5,310	19.8
Property taxes	675	5,146	19.1
Individual income taxes	545	4,150	15.4
Sales taxes	535	4,079	15.2
Corporate income taxes	123	940	3.5
Total	$3,527	$26,880	100.0%

(b) Sources of state and local government revenue, 2022

Figure 17.2 **Federal, State, and Local Sources of Revenue, 2022**

Panel (a) shows that individual income taxes are the most important source of revenue for the federal government, and social insurance taxes are the second most important source. Panel (b) shows that state and local governments receive large grants from the federal government, in part to help pay for federally mandated programs like Medicaid. Many local governments depend on property taxes to raise most of their tax revenue.

Source: U.S. Bureau of Economic Analysis.

and excise taxes account for much smaller fractions of federal revenues. In 2022, federal revenues of all types amounted to more than $5.0 trillion, or an average of $38,319 per household. Over the past 40 years, federal revenues as a share of gross domestic product (GDP—the value of all the final goods and services produced in the U.S. economy) have typically remained in a fairly narrow range between 17 percent and 19 percent, with a low of 16 percent in 2009 and a high of 21 percent in 2000.

Panel (b) shows that state and local governments rely on a different mix of revenue sources than does the federal government. In the past, the largest source of revenue for state and local governments was sales taxes. State and local governments also receive large grants from the federal government, which in 2022 were their largest source of revenue. These grants are intended in part to pay for programs that the federal government requires state and local governments to carry out. These programs, often called *federal mandates*, include the *Medicaid* program, which finances health care for many people with low incomes, and the Temporary Assistance for Needy Families (TANF) program, which provides financial assistance to low-income families with children. Local governments also raise substantial revenue from property taxes. Many local school districts, in particular, rely almost entirely on revenues from property taxes.

Progressive and Regressive Taxes

Economists often categorize taxes on the basis of the percentage of their income that people at different income levels pay in taxes:

Regressive tax A tax for which people with lower incomes pay a higher percentage of their income in tax than do people with higher incomes.

Progressive tax A tax for which people with lower incomes pay a lower percentage of their income in tax than do people with higher incomes.

- A tax is **regressive** if people with lower incomes pay a higher percentage of their income in tax than do people with higher incomes.
- A tax is **progressive** if people with lower incomes pay a lower percentage of their income in tax than do people with higher incomes.
- A tax is *proportional* if people with lower incomes pay the same percentage of their income in tax as do people with higher incomes.

The federal income tax is an example of a progressive tax. To see why, note first the important distinction between a tax rate and a tax bracket. A *tax rate* is the percentage of income paid in taxes. A *tax bracket* is the income range within which a tax rate applies. Table 17.2 shows the federal income tax brackets and tax rates for single taxpayers in 2023.

We can use Table 17.2 to calculate what Matt, a single taxpayer with an income of $100,000, pays in federal income tax. This example is somewhat simplified because we are ignoring the *exemptions* and *deductions* that taxpayers can use to reduce the amount of income subject to tax. For example, taxpayers are allowed to exclude from taxation a certain amount of income, called the *personal exemption*, that represents basic living expenses. Ignoring Matt's exemptions and deductions, he will have to make the tax payment to the federal government shown in Table 17.3. Matt's first $11,000 of income is in the 10 percent bracket, so he pays $1,100 in taxes on that part of his income. His next $33,725 of income is in the 12 percent bracket, so he pays $4,047. His next $50,650 of income is in the 22 percent bracket, so he pays $11,143. His last $4,625 of income is in the 24 percent bracket, so he pays $1,110. Therefore, his total federal income tax bill is $17,400.

Table 17.2

Federal Income Tax Brackets and Tax Rates for Single Taxpayers, 2023

Income Tax Brackets	Tax Rate
$11,000	10%
$11,001–$44,725	12
$44,726–$95,375	22
$95,376–$182,100	24
$182,101–$231,250	32
$231,251–$578,125	35
Over $578,125	37

Source: Internal Revenue Service.

Table 17.3

Federal Income Tax Paid on Taxable Income of $100,000

On Matt's . . .	Matt pays tax of . . .
first $11,000 of income	$1,100
next $33,725 of income	4,047
next $50,650 of income	11,143
last $4,625 of income	1,110
His total federal income tax payment is	$17,400

Apply the Concept

Which Groups Pay the Most in Federal Taxes?

In the chapter opener, we mentioned the ongoing debate over how much people with high incomes should pay in taxes. To evaluate this debate, it's useful to know how much each income group pays of the total taxes collected by the federal government. The following table shows projections for 2023 by the Tax Policy Center, with taxpayers divided into quintiles from the 20 percent with the lowest income to the 20 percent with the highest income. President Joe Biden has argued that taxpayers at the top of the income distribution are not paying their fair share of taxes. The last row shows data for this group. Column (1) shows the percentage of total income earned by each income group. Column (2) shows the percentage of federal individual income taxes paid by each income group. Column (3) shows the percentage of all federal taxes—including Social Security and Medicare payroll taxes—paid by each income group. Column (4) shows the average federal tax rate for each group, calculated by dividing total taxes paid by total income.

Income Category	(1) Share of Total Income Earned	(2) Share of Individual Income Taxes Paid	(3) Share of Total Federal Taxes Paid	(4) All Federal Taxes Paid as a Fraction of Income (average federal tax rate)
Lowest 20%	4.0%	−1.6%	0.7%	0.6%
Second 20%	8.4	−0.2	3.7	7.8
Middle 20%	14.2	6.1	10.0	13.0
Fourth 20%	20.4	14.4	18.0	17.5
Highest 20%	53.1	81.1	67.3	25.3
Total	100.0%	100.0%	100.0%	20.2%
Highest 1%	**16.2**	**36.0**	**25.1**	**31.2**

The data in columns (2) and (3) show that the 20 percent of taxpayers with the highest incomes pay about 81 percent of individual income taxes and about 67 percent of all federal taxes, which is greater than their 53 percent share of total income they earned, as shown in column (1). Only taxpayers in the highest quintile pay a larger share of taxes than their share of income. Taxpayers whose incomes put them in the top 1 percent earn about 16 percent of all income, and they pay about 36 percent of individual income taxes and 25 percent of all federal taxes. Many individuals in the lowest quintile of income, particularly those with children, receive tax credits from the federal government so that they in effect pay *negative* taxes.

Column (4) indicates that average tax rates rise as income rises. We can conclude that the federal taxes are *progressive*. Whether the federal tax system should be made more or less progressive remains a topic of political debate.

Your Turn: Test your understanding by doing related problem 2.11 at the end of this chapter.

Marginal and Average Income Tax Rates

Marginal tax rate The fraction of each additional dollar of income that must be paid in taxes.

Average tax rate Total tax paid divided by total income.

The fraction of each additional dollar of income that must be paid in taxes is called the **marginal tax rate**. The **average tax rate** is the total tax paid divided by total income. When a tax is progressive, as is the federal income tax, the marginal and average tax rates differ. For example, in Table 17.3, Matt had a marginal tax rate of 24 percent because that is the rate he paid on the last dollar of his income. But his average tax rate was:

$$\left(\frac{\$17{,}400}{\$100{,}000}\right) \times 100 = 17.4\%.$$

His average tax rate was lower than his marginal tax rate because the first $95,375 of his income was taxed at rates below his marginal rate of 24 percent.

The marginal tax rate is a better indicator than the average tax rate of how a change in a tax will affect people's willingness to work, save, and invest. For example, if Matt is considering working longer hours to increase his income, he will use his marginal tax rate to determine how much extra income he will earn after taxes. He will ignore his average tax rate because it does not represent the taxes he must pay on the *additional* income he earns. The higher the marginal tax rate, the lower the return he receives from working additional hours and the less likely he is to work those additional hours.

The Corporate Income Tax

The federal government taxes the profits earned by corporations under the *corporate income tax*. Unlike the individual income tax, the corporate tax is a flat rate of 21 percent, although, as mentioned in the chapter opener, President Biden has proposed raising the rate to 28 percent. Prior to 2018, there were brackets for the corporate income tax ranging from 15 percent to 35 percent.

Economists debate the costs and benefits of a separate tax on corporate profits. The corporate income tax ultimately must be paid by a corporation's owners—who are its shareholders—or by its employees, in the form of lower wages, or by its customers, in the form of higher prices. Some economists argue that if the purpose of the corporate income tax is to tax the owners of corporations, it would be better to do so directly by taxing the owners' incomes rather than by taxing the owners indirectly through the corporate income tax. Individual taxpayers already pay income taxes on the dividends and capital gains they receive from owning stock in corporations. In effect, the corporate income tax "double taxes" earnings on individual shareholders' investments in corporations. An alternative policy that avoids this double taxation would require corporations to calculate their total profits each year and send a notice to each shareholder, indicating the shareholder's portion of the profits. Shareholders would then be required to include this amount as taxable income on their personal income tax. Under another alternative policy, the federal government could continue to tax corporate income through the corporate income tax but allow individual taxpayers to receive corporate dividends and capital gains tax free.

International Comparison of Corporate Income Taxes

Since 2000, the governments of nearly every high-income country have cut their corporate income tax rates to increase investment spending and growth. Table 17.4 shows corporate income tax rates in 2000, 2010, and 2022. The tax rates given in the table include taxes at all levels of government. In the United States, for example, they include taxes imposed on corporate profits by state governments as well as by the federal government. The table shows that of the countries listed, only the United States did not reduce its corporate income tax rate between 2000 and 2010. Ireland has been particularly successful in using lower corporate income tax rates to attract foreign corporations to locate facilities there. Lower tax rates have led Microsoft, Intel, and Dell, among other U.S. firms, to base some of their operations in Ireland. The table shows that following passage of the Tax Cuts and Jobs Act of 2017, the corporate income tax rate in the United States became comparable to those in other high-income countries.

Prior to 2018, the high U.S. corporate tax rate led many large U.S. firms with significant sales in foreign countries to avoid returning profits earned in those countries back to the United States. By keeping their profits overseas, these U.S. firms did not have

Table 17.4

Corporate Income Tax Rates around the World

Country	Tax Rate in 2000	Tax Rate in 2010	Tax Rate in 2022
Canada	42%	29%	26%
France	38	34	26
Germany	52	30	30
Ireland	24	13	13
Italy	41	31	28
Japan	41	40	30
Spain	35	30	25
Sweden	28	26	21
United Kingdom	30	28	19
United States	39	39	26

Note: The rates given include taxes at all levels of government. In the United States, the rate includes state as well as federal taxes.

Source: Christina Enache, "Corporate Tax Rates around the World, 2022," taxfoundation.org, December 13, 2022.

to pay U.S. taxes on them, although the funds were also not available to be spent in the United States. The United States is unusual in that it imposes taxes on corporate earnings wherever they are earned, but it allows corporations to postpone paying the taxes until the profits are brought back to the United States. As a result, many U.S. corporations kept the bulk of their overseas profits outside the United States. They couldn't use these funds in the United States to build new facilities or engage in research and development, and they couldn't return them to shareholders. As part of the Tax Cuts and Jobs Act of 2017, Congress reduced the tax rate that U.S. corporations pay on their foreign profits to 10.5 percent. In 2023, President Biden proposed raising that rate to 21 percent.

Evaluating Taxes

We have seen that to raise revenue, governments have a variety of taxes available. In selecting which taxes to enact, governments take into account the following goals and principles:

- The goal of economic efficiency
- The ability-to-pay principle
- The horizontal-equity principle
- The benefits-received principle
- The goal of attaining social objectives

The Goal of Economic Efficiency We can briefly review the effect of taxes on economic efficiency (see Chapter 4, Section 4.4). Because a government tax on an activity, such as supplying labor or producing a good, raises the cost of engaging in that activity, less of it will occur. Figure 17.3 uses a demand and supply graph to illustrate this point for a sales tax. A sales tax increases the cost of supplying a good, which causes the supply curve to shift up by the amount of the tax. In the figure, the equilibrium price rises from P_1 to P_2, and the equilibrium quantity falls from Q_1 to Q_2. When a good is taxed, less of it is produced.

The government collects tax revenue equal to the tax per unit multiplied by the number of units sold. The green-shaded rectangle in Figure 17.3 represents the government's tax revenue. Although sellers appear to receive a higher price for the good—P_2—the price they receive after paying the tax falls to P_3. Because the price consumers pay is higher, consumer surplus has fallen. The price producers receive is lower, so producer surplus has also fallen. Some of the reduction in consumer surplus and producer surplus becomes tax revenue for the government. The rest of the reduction in consumer surplus and producer surplus is equal to the deadweight loss from the tax and is shown in the figure by the yellow-shaded triangle. The deadweight loss is called the *excess burden* of the tax. The **excess burden** is a measure of the efficiency loss to the economy that results from the tax having reduced the quantity of the good produced. *A tax is efficient if it imposes a small excess burden relative to the tax revenue it raises.*

Excess burden A measure of the efficiency loss to the economy that results from a tax having reduced the quantity of a good produced; also known as the deadweight loss.

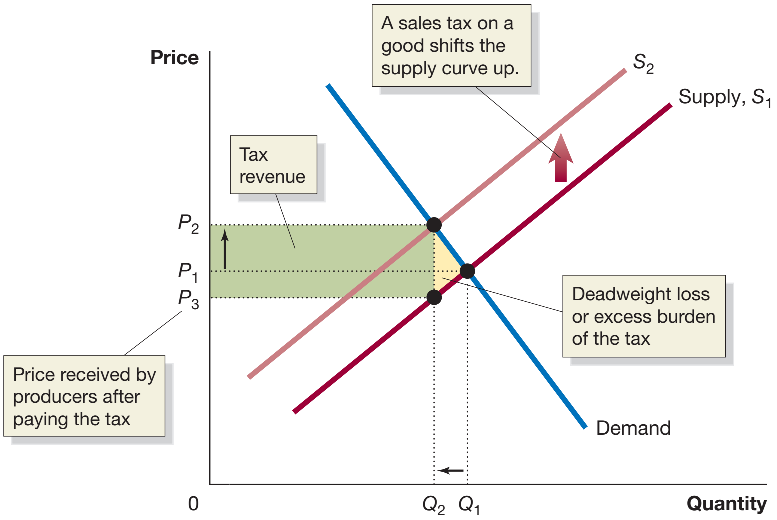


Figure 17.3

The Efficiency Loss from a Sales Tax

This figure reviews the discussion of the efficiency loss from a tax (see Chapter 4, Section 4.4). A sales tax increases the cost of supplying a good, which causes the supply curve to shift up, from S_1 to S_2. Without the tax, the equilibrium price of the good is P_1, and the equilibrium quantity is Q_1. After the tax is imposed, the equilibrium price rises to P_2, and the equilibrium quantity falls to Q_2. After paying the tax, producers receive P_3. The government receives tax revenue equal to the green-shaded rectangle. Some consumer surplus and some producer surplus become tax revenue for the government, and some become deadweight loss, shown by the yellow-shaded triangle. The deadweight loss is the *excess burden* of the tax.

Economists believe that to improve the economic efficiency of a tax system, the government should reduce its reliance on taxes that have a high deadweight loss relative to the revenue raised. The tax on interest earned from savings is an example of a tax with a high deadweight loss because savings often come from income that has already been taxed once. Therefore, taxing interest earned on savings from income that has already been taxed is essentially double taxation.

Taxation can have substantial effects on economic efficiency by altering incentives to work, save, or invest. For example, high taxes on work can lead to a reduction in the number of hours a person works, as well as how hard the person works or whether the person starts a business. A good illustration of this effect can be seen in the large differences between annual hours worked in Europe and in the United States. Europeans typically work fewer hours than do Americans. According to an analysis by the late Nobel Laureate Edward Prescott of Arizona State University, this difference was not always present. In the early 1970s, when European and U.S. tax rates on income were comparable, European and U.S. hours worked per employee were also comparable. Prescott found that virtually all of the difference between labor supply in the United States and labor supply in France and Germany since that time has been due to differences in their tax systems.

The *administrative burden* of a tax is another example of the deadweight loss of taxation. Individuals spend many hours during the year keeping records for income tax purposes, and they spend many more hours prior to April 15 preparing their tax returns. The opportunity cost of this time is billions of dollars each year and represents an administrative burden of the federal income tax. For corporations, complexity in tax planning results in substantial expenditures on accountants and software with the goal of minimizing the corporations' tax liabilities. The federal government also has to devote resources to enforcing the tax laws. The administrative burden that the complexity of the corporate income and individual income tax codes places on households, firms, and the government represents a loss of economic efficiency.

Wouldn't tax simplification reduce the administrative burden and the deadweight loss of taxation? The answer is "yes." So why is the tax code complicated? In part, complexity arises because the political process has resulted in different types of income being taxed at different rates, requiring rules to limit taxpayers' ability to avoid taxes by shifting income from one category to another. In addition, interest groups seek to pay lower taxes, while the majority of taxpayers, who do not benefit from these "tax loopholes," find it difficult to organize a drive for a simpler tax system.

The Ability-to-Pay Principle The *ability-to-pay principle* holds that when the government raises revenue through taxes, people who have a greater ability to pay should bear a greater share of the tax burden. To follow this principle, the government should attempt to achieve *vertical equity* by raising more taxes from people with high incomes than from people with low incomes. The federal income tax is consistent with the ability-to-pay principle. The sales tax, in contrast, is not consistent with the ability-to-pay principle because, on average, people with low incomes spend a larger fraction of their income than do people with high incomes. As a result, those with low incomes will pay a greater fraction of their income in sales taxes than will those with high incomes.

The Horizontal-Equity Principle The *horizontal-equity principle* states that people in the same economic situation should be treated equally. Although this principle seems desirable, it is not easy to follow in practice because it is sometimes difficult to determine whether two people are in the same economic situation. For example, two people with the same income are not necessarily in the same economic situation. Suppose one person does not work but receives an income of $70,000 per year entirely from interest received on bonds, and another person receives an income of $70,000 per year from working at two jobs 16 hours a day. In this case, we could argue that the two people are in different economic situations and should not pay the same tax. Although policymakers and economists usually consider horizontal equity when evaluating proposals to change the tax system, it is not a principle they can easily follow.

The Benefits-Received Principle According to the *benefits-received principle*, people who receive the benefits from a government program should pay the taxes that support the program. For example, if a city operates a marina that private boat owners use, the government should raise the revenue to operate the marina by levying a tax on the boat owners. Raising the revenue through a general income tax that both boat owners and non-boat owners pay would be inconsistent with the benefits-received principle. Because the government has many programs, however, it would be impractical to identify and tax the beneficiaries of every program.

The Goal of Attaining Social Objectives The tax code is sometimes used to attain social objectives. Here are two examples: (1) Congress has promoted home ownership by making the interest borrowers pay on home mortgages—loans households take out to buy homes—deductible from the individual income taxes they owe; (2) Congress also has exempted from the individual income tax compensation employees receive in the form of health insurance and certain other *fringe benefits*. If you receive a $1,000 raise, you must pay federal income taxes on that amount. If, instead, your employer spends an additional $1,000 to provide you with health insurance, the amount is not taxed.

Some economists and policymakers have questioned whether provisions like these in the tax code violate the principle of horizontal equity. A homeowner receives a significant financial advantage not available to a renter in comparable economic circumstances. Similarly, someone whose employer provides generous health insurance benefits receives a significant advantage not available to someone whose employer doesn't offer health insurance or who offers an inexpensive policy with only limited coverage. In designing the federal tax code, Congress has to balance its pursuit of social objectives against the goals and principles of tax policy that we listed earlier.

Apply the Concept

Should the Federal Government Begin to Tax Wealth?

The federal government taxes income—but not wealth. Your income is your earnings during the year, while your wealth is the difference between the value of your *assets* and the value of your *liabilities*. As we saw in Chapter 8, Section 8.3, an asset is anything of value that you own, and a liability is anything you owe. Stocks that you own are assets, while a loan you take out to buy a car is a liability. Your wealth is also called your *net worth*. In 2021, Massachusetts Senator Elizabeth Warren introduced a bill in Congress under which, in addition to the tax it imposes on income, the federal government would tax households at a rate of 2 percent on wealth above $50 million and 3 percent on wealth above $1 billion.

IOWA
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WARREN

Keith Turrill/Alamy Stock Photo

Would a new wealth tax, as proposed by Senator Elizabeth Warren, be good economic policy?

Congress didn't pass that bill, but in 2023, President Joe Biden proposed a different wealth tax under which people with more than $100 million in wealth would have to pay a tax on their *unrealized capital gains*. A capital gain is an increase in the market price of an asset. If you buy one share of Apple stock for $175 and its price on the stock market rises to $200, you have a capital gain of $25. Capital gains have only been taxed when the gains are *realized*, meaning that you have sold the asset and earned income equal to the capital gain. An unrealized capital gain—a gain on an asset that you haven't sold—is part of your wealth, but not your income, and hasn't been taxable. In late 2023, it seemed unlikely that Congress would enact President Biden's proposal.

Constitutional scholars have debated whether the federal government can legally tax wealth. The Sixteenth Amendment to the Constitution states that "the Congress shall have power to lay and collect taxes on incomes" but doesn't explicitly authorize taxes on wealth. Leaving aside the constitutional question, would a wealth tax be good economic policy? A wealth tax like the one President Biden proposed performs well in meeting the *ability-to-pay principle* because people with wealth above $100 million have a greater ability to pay a tax than would people with little or no wealth. President Biden and other supporters of a wealth tax argue that it would help reduce inequality in wealth, which they believe is an important social objective.

A wealth tax performs less well in meeting the *horizontal-equity principle* because one person might have his wealth in stocks or other financial assets, which he might easily sell to pay the tax, while another might have her wealth in the form of a business and might have to borrow to pay the tax. Wealth taxes also do not distinguish between financial wealth that may be generating high returns to its owner and wealth in the form of real estate or art that may be generating low or negative returns.

Many economists believe that a wealth tax does a poor job meeting the goal of *economic efficiency*. Governments often have difficulty administering wealth taxes because wealth is more difficult to measure than is income. For instance, opinions can differ on the value of a private business such as a restaurant. Tax avoidance is also easier with a wealth tax than with an income tax. Not only can someone put a low value on her wealth that the government may have difficulty challenging, she may also shift some assets to other countries where the assets can be difficult for the government to discover and tax. Because of administrative issues, wealth taxes in European countries have typically not raised much revenue. President Biden's proposal was particularly complex. The tax a person owed would depend on the tax rate the person was paying on other income. The tax would be paid in installments over nine years, and the payments could be used to offset future capital gains taxes if the asset being taxed were sold. Given uncertainty about valuing some assets, particularly private businesses, it seems likely that the Internal Revenue Service might have disagreements with some taxpayers over the amounts they owed. Some of these disagreements might need to be settled in the courts, which can be time-consuming and costly. These considerations indicate that the excess burden of a wealth tax could be substantial.

Perhaps the greatest efficiency losses from a wealth tax would result from the disincentive to accumulate wealth as a result of the tax. If wealthy people increase their spending or their donations to charity as a result of the tax, fewer funds will be available for investment in new capital, including factories, software, and research and development. A decline in spending on capital is likely to slow the rate of economic growth, which will reduce future incomes. Wealthy people may also change the types of investments they make and reduce economic growth by doing so. As a columnist for the *New York Times* noted: "If wealthy investors are on the hook for a wealth tax every year, they may strongly favor investments that pay a steady, reliable dividend over those that are risky and will take many years to pay off." The riskier investments, though, may raise the long-run growth rate of the economy more than investments in, for instance, U.S. Treasury securities. A slower rate of economic growth can have a greater effect on people with lower incomes than on people with higher incomes. If so, a wealth tax would be an example of a tax that reduces income inequality in the short run while increasing it in the long run—a possibility we noted in the chapter opener.

The Organization for Economic Co-operation and Development (OECD) is a group of 36 higher-income countries. In recent years, OECD countries have moved away from taxing wealth. In 1990, 12 OECD countries had wealth taxes, while by 2017 only 4 still did. A study by the OECD stated:

> Decisions to repeal net wealth taxes have often been justified by efficiency and administrative concerns and by the observation that net wealth taxes have frequently failed to meet their redistributive goals. The revenues collected from net wealth taxes have also, with a few exceptions, been very low.

Your Turn: Test your understanding by doing related problem 2.15 at the end of this chapter.

17.3 Tax Incidence Revisited: The Effect of Price Elasticity

LEARNING OBJECTIVE: Explain the effect of price elasticity on tax incidence.

There is an important difference between who is legally required to send a tax payment to the government and who actually bears the burden of a tax (see Chapter 4, Section 4.4). Recall that the actual division of the burden of a tax between buyers and sellers in a market is known as **tax incidence**. We can go beyond the basic analysis of tax incidence and consider how the price elasticity of demand and price elasticity of supply affect how the burden of a tax is shared between consumers and firms.

Tax incidence The actual division of the burden of a tax between buyers and sellers in a market.

If the government imposes a 10-cents-per-gallon federal excise tax on gasoline, consumers will pay the majority of the tax because the elasticity of demand for gasoline is smaller than the elasticity of supply. In fact, we can draw a general conclusion: *When the demand for a product is less elastic than the supply, consumers pay the majority of the tax on the product. When demand for a product is more elastic than the supply, firms pay the majority of the tax on the product.*

Figure 17.4 shows why this conclusion is correct: D_1 is inelastic between points *A* and *B*, and D_2 is elastic between points *A* and *C*. With demand curve D_1, the

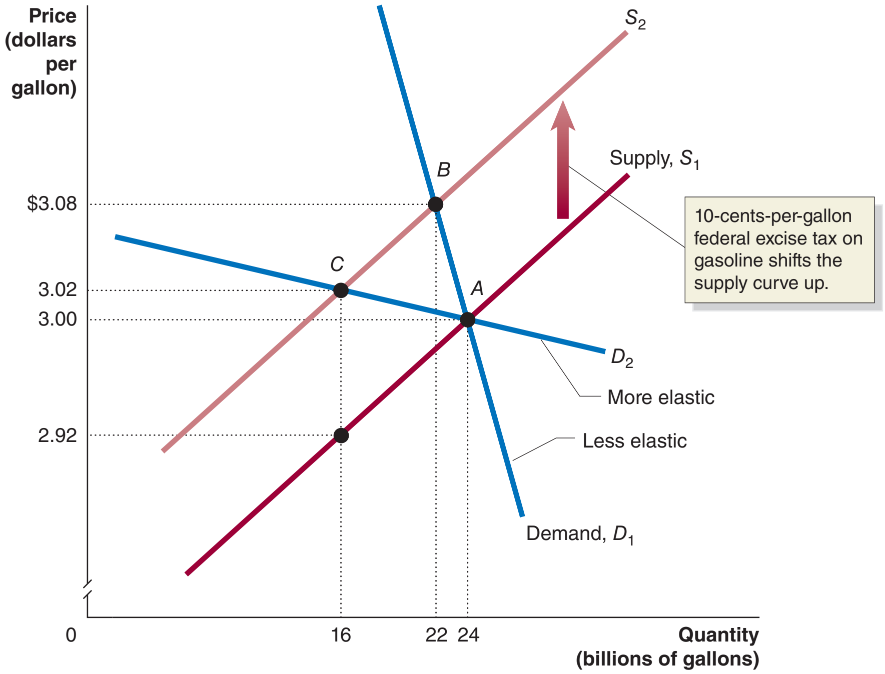


Figure 17.4

The Effect of Elasticity on Tax Incidence

When demand is more elastic than supply, consumers bear less of the burden of a tax. When supply is more elastic than demand, firms bear less of the burden of a tax. D_1 is inelastic between points *A* and *B*, and D_2 is elastic between points *A* and *C*. With demand curve D_1, a 10-cents-per-gallon tax raises the equilibrium price from $3.00 (point *A*) to $3.08 (point *B*), so consumers pay 8 cents of the tax, and firms pay 2 cents. With D_2, a 10-cents-per-gallon tax on gasoline raises the equilibrium price only from $3.00 (point *A*) to $3.02 (point *C*), so consumers pay 2 cents of the tax. Because in this case producers receive $2.92 per gallon after paying the tax, their share of the tax is 8 cents per gallon.

10-cents-per-gallon tax raises the market price of gasoline from $3.00 (point *A*) to $3.08 (point *B*) per gallon, so consumers pay 8 cents of the tax, and firms pay 2 cents. With D_2, the market price rises only to $3.02 (point *C*) per gallon, and consumers pay only 2 cents of the tax. With demand curve D_2, sellers of gasoline receive only $2.92 per gallon after paying the tax. So, the amount they receive per gallon after taxes falls from $3.00 to $2.92 per gallon, and they pay 8 cents of the tax.

Don't Let This Happen to You

Don't Confuse Who Pays a Tax with Who Bears the Burden of the Tax

Consider the following statement: "Of course, I bear the burden of the sales tax on everything I buy. I can show you my sales receipts with the 6 percent sales tax clearly labeled. The seller doesn't bear that tax. I do."

The statement is incorrect. To understand why, think about what would happen to the price of a product if the sales tax on it were eliminated. Figure 17.4 shows that the price of the product would fall because the supply curve would shift down by the amount of the tax. The equilibrium price, however, would fall by less than the amount of the tax. (If you doubt that this statement is correct, draw the graph to convince yourself.) So, the gain from eliminating the tax would be received partly by consumers in the form of a lower price but also partly by sellers in the form of a new price that is higher than the amount they received from the old price minus the tax. Therefore, the burden from imposing a sales tax is borne partly by consumers and partly by sellers.

In determining the burden of a tax, what counts is not what is printed on the receipt for a product but how the price of a product changes as a result of the tax.

Your Turn: Test your understanding by doing related problem 3.3 at the end of the chapter.

Apply the Concept

Do Corporations Really Bear the Burden of the Federal Corporate Income Tax?

Sorbis/Shutterstock

Will these consumers be paying part of Apple's corporate income tax when they buy an Apple product?

At a campaign appearance, 2012 Republican presidential candidate Mitt Romney encountered hecklers who suggested that taxes on corporations be raised. Romney responded by saying: "Corporations are people, my friend." The hecklers responded: "No, they're not!" To which Romney responded: "Of course they are. Everything corporations earn ultimately goes to people. Where do you think it goes?" Romney was correct that, in the eyes of the law, corporations are persons. But there is a larger question: Who actually pays the corporate income tax? The incidence of the corporate income tax is one of the most controversial questions in the economics of tax policy. It is straightforward to determine the incidence of the gasoline tax by using demand and supply analysis. Determining the incidence of the corporate income tax is more complicated because economists disagree about how corporations respond to the tax.

A study by the Congressional Budget Office stated:

> A corporation may write its check to the Internal Revenue Service for payment of the corporate income tax, but the money must come from somewhere: from reduced returns to investors in the company, lower wages to its workers, or higher prices that consumers pay for the products the company produces.

Most economists agree that some of the burden of the corporate income tax is passed on to consumers in the form of higher prices. There is also some agreement that, because the corporate income tax reduces the rates of return received by investors, it results in less investment in corporations. This reduced investment means workers have less capital available to them. When workers have less capital, their productivity and their wages both fall (see Chapter 16, Section 16.1). In this way, some of the burden of the corporate income tax is shifted from corporations to workers in the form of lower wages.

The Congressional Budget Office (CBO) has estimated that about 25 percent of the burden of the corporate income tax is in the form of lower wages. Other studies have estimated that lower wages may account for as much as 90 percent of the burden. The deadweight loss or excess burden from the corporate income tax is substantial. A CBO study estimated that this excess burden could equal more than half of the revenues raised by the tax. This estimate would make the corporate income tax one of the most inefficient taxes imposed by the federal government.

In 2018, Congress and the Trump administration enacted a wide-ranging overhaul of the tax system that included a cut in the corporate income tax rate from 35 percent to 21 percent. President Trump and his advisers argued that the tax cut would increase investment by corporations, which would increase the productivity of workers and their wages. Some economists and policymakers were skeptical of these claims and, as we noted in the chapter opener, President Biden argued that the fairness of the U.S. tax system would be increased if the corporate income tax rate were raised to 28 percent. The debate over the corporate income tax, including the question of whether a higher corporate tax rate increases or decreases income inequality, is largely a debate over the incidence of the tax—who bears the burden of the tax and the likely effects of the tax on productivity, economic growth, and wages.

Your Turn: Test your understanding by doing related problems 3.4 and 3.5 at the end of this chapter.

Solved Problem 17.3

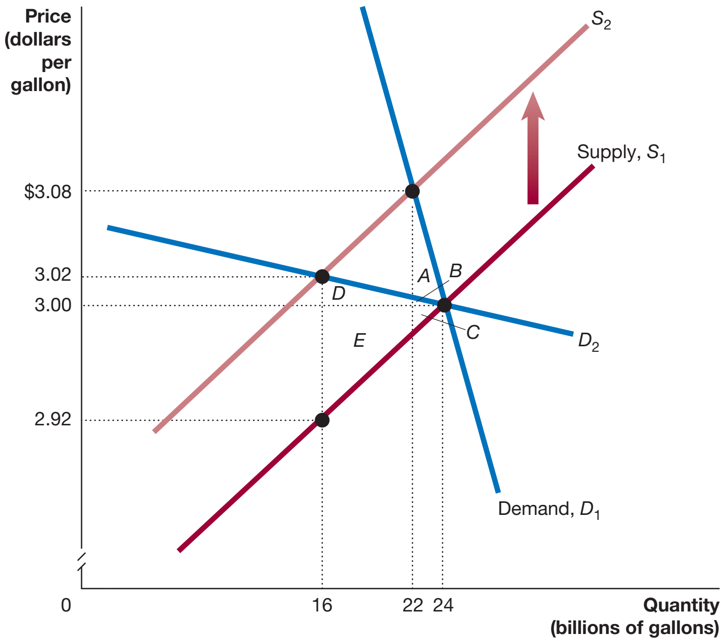
The Effect of Price Elasticity on the Excess Burden of a Tax

Explain whether you agree with the following statement: "For a given supply curve, the excess burden of a tax will be greater when demand is less elastic than when it is more elastic." Illustrate your answer with a demand and supply graph.

Solving the Problem

Step 1: Review the chapter material. This problem is about both excess burden and tax incidence, so you may want to review the sections "Evaluating Taxes" and "Tax Incidence Revisited: The Effect of Price Elasticity."

Step 2: Draw a graph to illustrate the relationship between tax incidence and excess burden. Figure 17.4 is a good example of the type of graph to draw. Be sure to indicate the areas representing excess burden.



Step 3: **Use the graph to evaluate the statement.** For a given supply curve, when demand is more elastic, as with demand curve D_2, the fall in equilibrium quantity is greater than when demand is less elastic, as with demand curve D_1. The deadweight loss when demand is less elastic is shown by the area of the triangle made up of areas *A*, *B*, and *C*. The deadweight loss when demand is more elastic is shown by the area of the triangle made up of areas *B*, *C*, *D*, and *E*. The area of the deadweight loss is clearly larger when demand is more elastic than when it is less elastic. Recall that the excess burden of a tax is measured by the deadweight loss. Therefore, when demand is less elastic, the excess burden of a tax is *smaller* than when demand is more elastic. We can conclude that the statement is incorrect. The key to this result is that the equilibrium quantity after the tax is smaller with a more elastic demand curve than with a less elastic demand curve. This larger decline in quantity results in a larger decline in economic surplus (which is the sum of consumer surplus and producer surplus) and a greater excess burden.

Your Turn: For more practice, do related problems 3.9 and 3.10 at the end of this chapter.

17.4 Income Distribution and Poverty

LEARNING OBJECTIVE: Discuss income distribution and income mobility and the role of policy in addressing these issues.

No country has complete income equality. Inevitably, some individuals will have very high incomes, and some individuals will have very low incomes. But how unequal is the distribution of income in the United States today? How does it compare with the distribution of income in the United States in the past or with the distribution of income in other countries today? What determines the distribution of income? And, to return to an issue raised at the beginning of this chapter, how does the tax system affect the distribution of income? We will explore these questions in this section.

Measuring the Income Distribution and Measuring Poverty

Tables 17.5 and 17.6 show that the distribution of income is clearly unequal. Table 17.5 shows that in 2022, while 15.7 percent of U.S. households had annual incomes less than $25,000, the top 37.5 percent of households had incomes greater than $100,000.

Table 17.6 divides households in the United States into five groups, from the 20 percent with the lowest incomes to the 20 percent with the highest incomes. The fraction of total income received by each of the five groups is shown for selected years. Table 17.6 reinforces the fact that income is unequally distributed in the United States. The first row shows that in 2022, the 20 percent of U.S. households with the lowest incomes received only 3.0 percent of all income, while the 20 percent with the highest incomes received 52.1 percent of all income.

Table 17.5

The Distribution of Household Income in the United States, 2022

Annual Income	Percentage of All Households
$0–$24,999	15.7%
$25,000–$49,999	18.2
$50,000–$74,999	16.2
$75,000–$99,999	12.3
$100,000–$199,999	25.6
$200,000 and above	11.9

Source: Gloria Guzman and Melissa Kollar, U.S. Census Bureau, *Current Population Reports, P60-279, Income in the United States: 2022*, Washington, DC: U.S. Government Printing Office, September 2023.

Table 17.6

How Has the Distribution of Income in the United States Changed over Time?

Year	Lowest 20%	Second 20%	Middle 20%	Fourth 20%	Highest 20%
2022	3.0%	8.2%	14.0%	22.5%	52.1%
2000	3.6	8.9	14.8	23.0	49.8
1990	3.9	9.6	15.9	24.0	46.6
1980	4.3	10.3	16.9	24.9	43.7
1970	4.1	10.8	17.4	24.5	43.3
1960	3.2	10.6	17.6	24.7	44.0
1950	3.1	10.5	17.3	24.1	45.0
1936	4.1	9.2	14.1	20.9	51.7

Note: Rows may not sum to 100% due to rounding.

Sources: Gloria Guzman and Melissa Kollar, U.S. Census Bureau, *Current Population Reports, P60-279, Income in the United States: 2022*, Washington, DC: U.S. Government Printing Office, September 2023; U.S. Census Bureau, Current Population Reports, P60–221, *Income in the United States, 2002*, Washington, DC: U.S. Government Printing Office, September 2003; and U.S. Census Bureau, *Historical Statistics of the United States, Colonial Times to 1970*, Washington, DC: U.S. Government Printing Office, 1975.

Table 17.6 also shows that, over time, there have been some changes in the distribution of income. There was a moderate decline in inequality between 1936 and 1980, followed by an increase in inequality during the years after 1980. We will discuss some reasons for the recent increase in income inequality later in this chapter.

The Poverty Rate in the United States Some of the discussion of the distribution of income focuses on poverty. The federal government has a formal definition of poverty that was first developed in the early 1960s. According to this definition, a family is below the **poverty line** if its annual income is less than three times the amount necessary to purchase the minimum quantity of food required for adequate nutrition. In 2022, the poverty line was $27,750 for a family of four. Figure 17.5 shows the **poverty rate**, or the percentage of the U.S. population that was in poverty according to the federal government's definition during each year between 1960 and 2022. Between 1960 and 1973, the poverty rate declined by half, falling from 22.2 percent to 11.1 percent of the population. In the past 50 years, however, the poverty rate has declined very little. In 2022, at 11.5 percent, the poverty rate was a little above what it was in 1973.

Poverty line A level of annual income equal to three times the amount of money necessary to purchase the minimum quantity of food required for adequate nutrition.

Poverty rate The percentage of the population that is in poverty, according to the federal government's definition.

Different groups in the population have substantially different poverty rates. Figure 17.6 shows that while the overall poverty rate in 2022 was 11.5 percent, the rates were higher among women who head a family with no spouse present, among Black people, and among Hispanic people. The poverty rates were lower for white and Asian people, as well as for families headed by married couples.

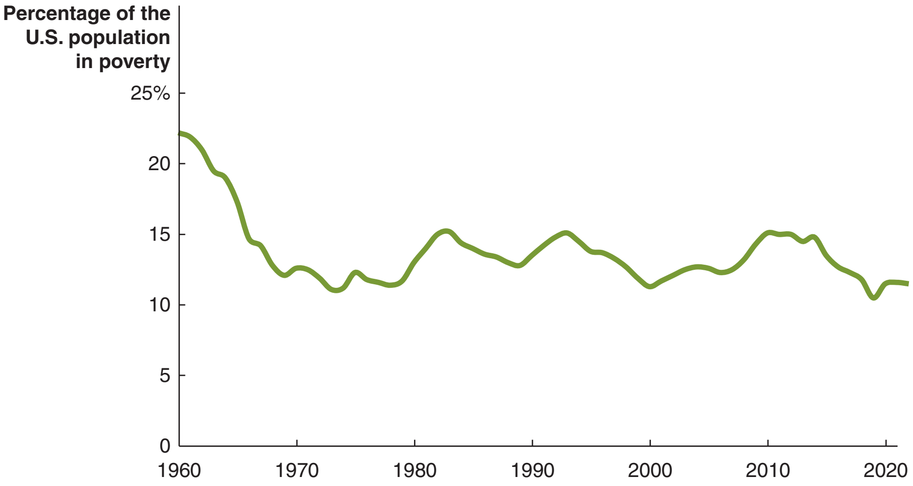


Figure 17.5

Poverty in the United States, 1960–2022

The poverty rate in the United States declined from 22 percent of the population in 1960 to 11 percent in 1973. Over the past 50 years, the poverty rate has fluctuated between 11 and 15 percent of the population.

Source: Emily A. Shrider and John Creamer, U.S. Census Bureau, *Current Population Reports, P60-280, Poverty in the United States: 2022*, Washington, DC: U.S. Government Printing Office, September 2023.

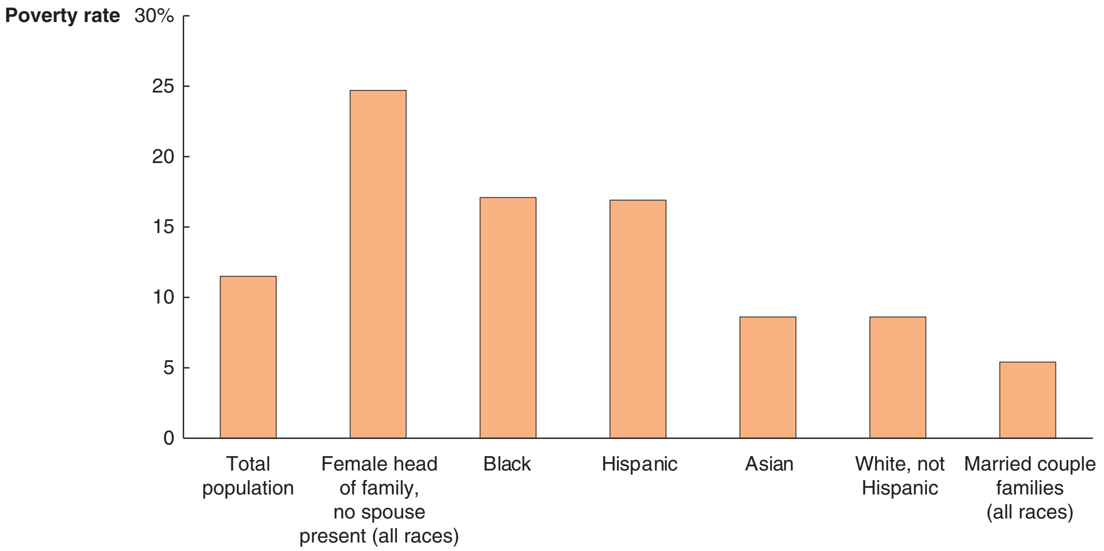


Figure 17.6 **Poverty Rates Vary across Groups, 2022**

The overall poverty rate in 2022 was 11.5 percent. The rates were higher among women who head a family with no spouse present, among Black people, and among Hispanic people. The poverty rates were lower for white and Asian people, as well as for families headed by married couples.

Note: Hispanics can be of any race.

Source: Emily A. Shrider and John Creamer, U.S. Census Bureau, *Current Population Reports, P60-280, Poverty in the United States: 2022*, Washington, DC: U.S. Government Printing Office, September 2023.

Showing the Income Distribution with a Lorenz Curve

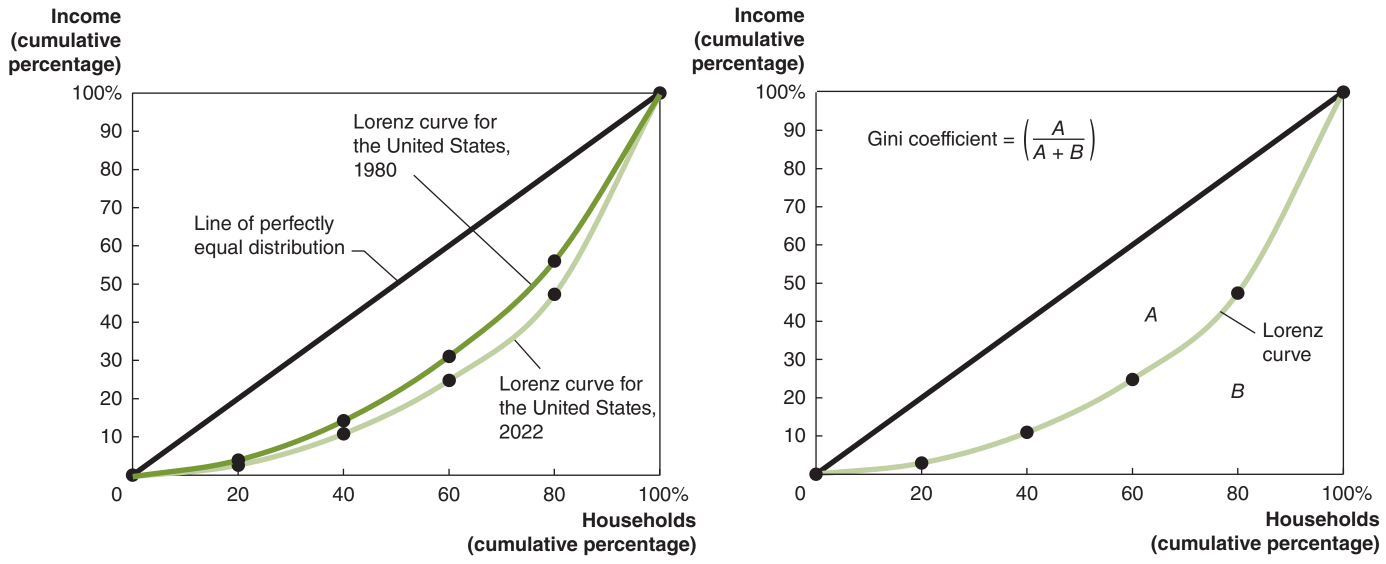
Lorenz curve A curve that shows the distribution of income by arraying incomes from lowest to highest on the horizontal axis and indicating the cumulative fraction of income earned by each fraction of households on the vertical axis.

Figure 17.7 presents the distribution of income using a **Lorenz curve**, which shows the distribution of income by arraying incomes from lowest to highest on the horizontal axis and indicating the cumulative fraction of income earned by each fraction of households on the vertical axis. If the distribution of income were perfectly equal, a Lorenz curve would be a straight line because the first 20 percent of households would earn 20 percent of total income, the first 40 percent of households would earn 40 percent of total income, and so on. Panel (a) of Figure 17.7 shows a Lorenz curve for the actual distribution of income in the United States in 1980 and another curve for the distribution of income in 2022, using the data from Table 17.6. We know that income was distributed more unequally in 2022 than in 1980 because the Lorenz curve for 2022 is farther away from the line of equal distribution than is the Lorenz curve for 1980.

Panel (b) illustrates how to calculate the *Gini coefficient*, which provides one way of summarizing the information provided by a Lorenz curve. The Gini coefficient is equal to the area between the line of perfect income equality and the Lorenz curve—area A in panel (b)—divided by the whole area below the line of perfect equality—area A plus area B in panel (b). Or:

$$\text{Gini coefficient} = \left(\frac{A}{A + B}\right).$$

If the income distribution were completely *equal*, the Lorenz curve would be the same as the line of perfect income equality, area A would be zero, and the Gini coefficient would be zero. If the income distribution were completely *unequal*, area B would be zero, and the Gini coefficient would equal 1. Therefore, the greater the degree of income inequality, the greater the value of the Gini coefficient. In 1980, the Gini coefficient for the United States was 0.403. In 2022, it was 0.467, which tells us again that income inequality increased between 1980 and 2022.



(a) Lorenz curves for 1980 and 2022

(b) Gini coefficient

Figure 17.7 **The Lorenz Curve and Gini Coefficient**

In panel (a), the Lorenz curves show the distribution of income by arraying incomes from the lowest to the highest on the horizontal axis and indicating the cumulative fraction of income by the fraction of households on the vertical axis. The straight line represents perfect income equality. Because the Lorenz curve for 1980 is closer to the line of perfect equality than the Lorenz curve for 2022, we know that income was more equally distributed in 1980 than in 2022. In panel (b), we show the Gini coefficient, which is equal to the area between the line of perfect income equality and the Lorenz curve—area *A*—divided by the whole area below the line of perfect equality—area *A* plus area *B*. The closer the Gini coefficient is to 1, the more unequal the income distribution.

Problems in Measuring Poverty and the Distribution of Income

The measures of poverty and the distribution of income that we have discussed to this point may be misleading for two reasons. First, these measures are snapshots in time that do not take into account *income mobility*, which refers to changes in an individual's or a family's income over time. Second, they ignore the effects of government programs meant to reduce poverty.

Income Mobility in the United States We expect that most people will not remain in the same place on the income distribution their whole lives. When you graduate from college, your income will rise as you start a new job. A family may be below the poverty line one year because the main wage earner is unemployed but may rise well above the poverty line the next year, when that wage earner finds a job. A medical student may have a very low income for several years but a very high income after graduating and establishing a medical practice. It is also true that someone might have a high income one year—perhaps from making a very profitable investment in the stock market or selling a business—and have a much lower income in future years.

Statistics on income mobility are more difficult to collect than statistics on income during a particular year because they require following the same people over a number of years. A study by the U.S. Census Bureau tracked the incomes of the same households for each year from 2009 to 2012. Figure 17.8 shows the results of the study. Each column represents one quintile—or 20 percent—of households, arranged by their incomes in 2009. Reading the columns from the bottom up, we can see where the households that started in that quintile in 2009 ended up in 2012. For example, the bottom quintile (the first column) consists of households with incomes of less than $23,024 in 2009. (All values are measured in 2012 dollars to correct for the effects of inflation.) About 69 percent of these households were still in the bottom quintile in 2012. Only a small number—1.5 percent—had moved all the way to the top quintile, but more than 30 percent had moved up at least one quintile. At the other end of the income

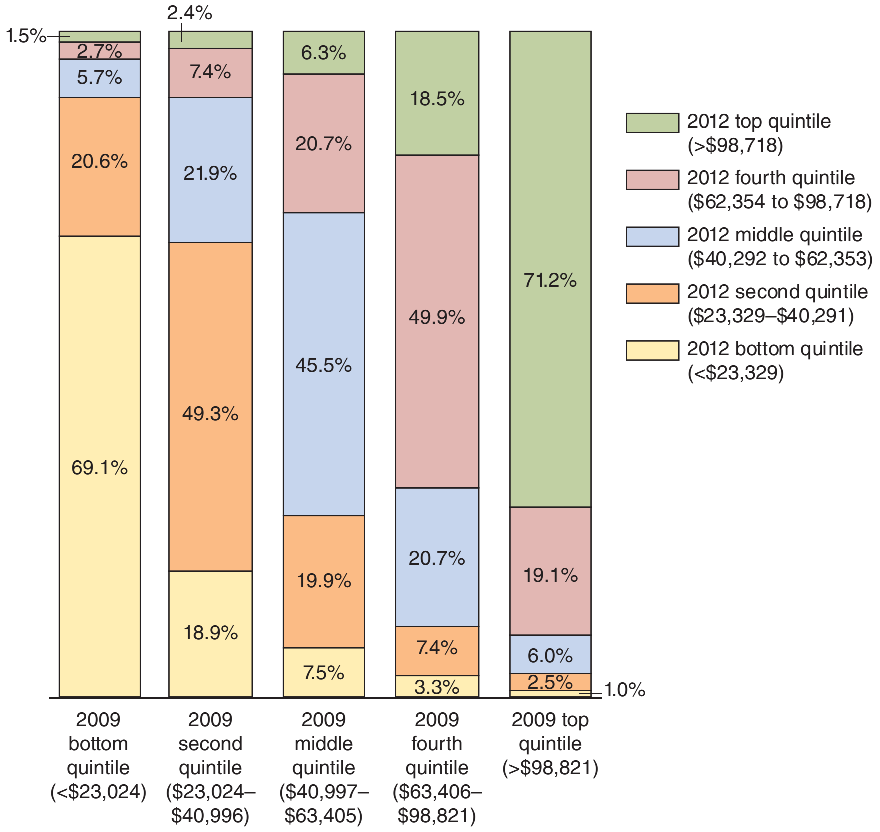
Figure 17.8

Income Mobility in the United States, 2009–2012

Each column represents one quintile—or 20 percent—of households, arranged by their incomes in 2009. Reading the columns from the bottom up, we can see where the households that started in that quintile in 2009 ended up in 2012. Only 69 percent of the households that were in the bottom quintile of income in 2009 were still in the bottom quintile in 2012. About 71 percent of the households that were in the top quintile of income in 2009 were still in the top quintile in 2012.

Note: Incomes are in 2012 dollars to correct for the effects of inflation.

Source: John J. Hisnanick, Katherine G. Giefer, and Abby K. Williams, U.S. Census Bureau, Current Population Reports, P70-142, *Dynamics of Economic Well-Being: Fluctuations in the U.S. Income Distribution: 2009–2012*, Washington, DC: U.S. Government Printing Office, July 2017.



distribution, of those households in the top income quintile—with incomes of more than $98,821—in 2009, about 71 were still in the top quintile in 2012. The results of this study indicate that even during a period as short as three years, there is significant income mobility in the United States.

An earlier study by Peter Gottschalk of Boston College and Sheldon Danziger of the University of Michigan that covered a longer time period also provides evidence of significant income mobility. In that study, only 47 percent of people who were in the lowest 20 percent of incomes in 1968 were still in the lowest bracket in 1991. More than 25 percent had incomes in 1991 that put them in the middle- or higher-income brackets. Of those people who were in the highest-income bracket in 1968, only 42 percent were still in the highest bracket in 1991; almost 8 percent of this group had fallen to the lowest-income bracket.

Some economists and policymakers are concerned, though, that the extent of income mobility in the United States may have declined over time and that mobility may now be lower in the United States than in Canada and Western Europe. For example, a study by Markus Jäntti of Stockholm University in Sweden and colleagues found that 42 percent of U.S. males who began life in the bottom quintile of the income distribution remained there as adults. In contrast, only 25 percent of Danish males and 30 percent of British males born into the bottom quintile remained there as adults.

Another study by the U.S. Census Bureau indicates that many people who are in poverty do not remain so for long periods. The study found that of people who were in poverty at some time during the years 2009–2011, 44 percent were in poverty for four months or less, and the average time in poverty was less than seven months. Of the people who were in poverty in January 2009, only about 26 percent remained in poverty every month through December 2011. Finally, another Census study found that only 3.3 percent of the U.S. population was in poverty every month from January 2017 through December 2019, although 27.1 percent of the U.S. population experienced a spell of poverty lasting at least two months during that period.

The Effect of Taxes and Transfers A second reason the conventional statistics on poverty and income distribution may be misleading is that they omit the effects of government programs. Because of government programs, there is a difference between the income people earn and the income they actually have available to spend. The data in Table 17.6 show the distribution of income before taxes are paid. We have seen that at the federal level, taxes are progressive, meaning that people with high incomes pay a larger share of their incomes in taxes than do people with low incomes. Therefore, income remaining after taxes is more equally distributed than is income before taxes. The table also does not include income from *transfer payments* individuals receive from the government, such as Social Security payments to retired and disabled people. The Social Security system has been very effective in reducing the poverty rate among people older than 65. In 1960, 35 percent of people over age 65 in the United States had incomes below the poverty line. By 2022, only 10.2 percent of people over age 65 had incomes below the poverty line.

Individuals with low incomes also receive noncash benefits, such as health insurance through the Medicare program, food stamps, free school lunches, and rent subsidies. The government's Supplemental Nutrition Assistance Program, more commonly called the *food stamp program*, has been a particularly important noncash benefit. Under this program, individuals with low incomes can buy, at a discount, coupons to purchase food in supermarkets. In 2023, more than 42 million people participated in this program, at a cost to the federal government of $127 billion. Because individuals with low incomes are more likely to receive transfer payments and other benefits from the government than are individuals with high incomes, the distribution of income is more equal if we take these benefits into account.

A study by the Congressional Budget Office (CBO) analyzed the effects of federal taxes and transfer programs on the distribution of income in 2019, the most recent year for which data are available. Figure 17.9 shows the ratio of the average income of the highest income quintile of households to each of the lower quintiles, with income measured before taxes are paid and transfers are received. The figure shows that taking into account taxes and transfers makes a significant difference to the income distribution, particularly with respect to the gap between the highest and lowest quintiles. Before the effects of taxes and transfers, the top quintile of households has 16.5 times the income of the lowest quintile. Taking into account the effects of taxes and transfers, the top quintile has 6.3 times the income of the lowest quintile. The CBO study looked at only

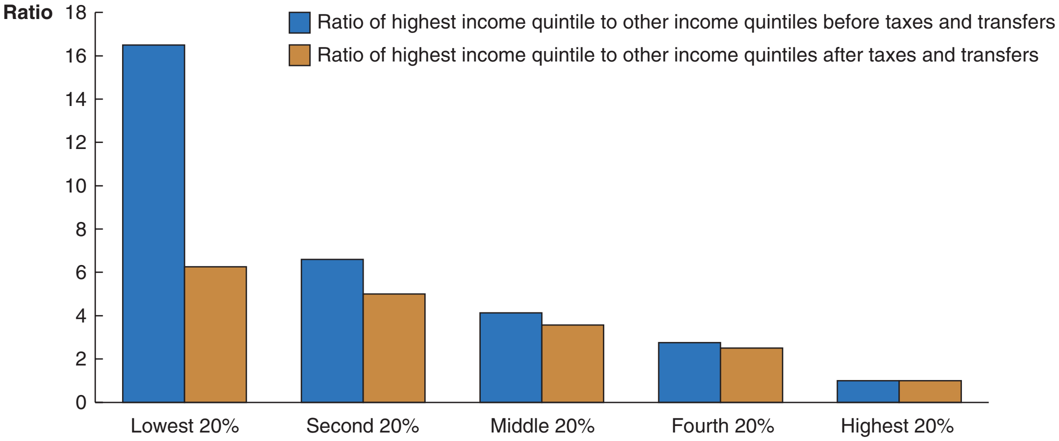


Figure 17.9 **The Effect of Taxes and Transfers on the Distribution of Household Income in the United States, 2019**

Taking into account taxes and transfers makes a significant difference to the income distribution. Before the effects of taxes and transfers, the top quintile has 16.5 times the income of the lowest quintile. Taking into account the effects of taxes and transfers, the top quintile has only 6.3 times the income of the lowest quintile.

Source: Congressional Budget Office, "The Distribution of Household Income, 2019," November 15, 2022.

the effects of federal tax and transfer policies. Taking into account the effects of state and local tax and transfer policies would likely further reduce the inequality of the income distribution.

Explaining Income Inequality

The novelists Ernest Hemingway and F. Scott Fitzgerald supposedly once had a conversation about the rich. Fitzgerald said to Hemingway: "You know, the rich are different from you and me." To which Hemingway replied: "Yes. They have more money." Although witty, Hemingway's joke doesn't help answer the question of why the rich have more money. We can consider several factors that help explain income inequality.

Differences in the Number of Income Earners per Household Most of the data on inequality that we have used in this chapter are derived from the U.S. Census Bureau's surveys of households. Looking at data on the distribution of income of households can give a distorted view of the distribution of income of individuals. The 40 percent of households with the lowest incomes are likely to have one or fewer income earners, while the 20 percent of households with the highest incomes are likely to have two or more income earners. As a result, the distribution of income among income earners is less unequal than it is among households. Households with low incomes have fewer earners because they are more likely to be retired or to be headed by a single parent. Households with high incomes are more likely to be younger, and three-quarters of them are headed by a married couple.

Differences in Returns to the Factors of Production One answer to the question of why incomes differ is given by the *marginal productivity theory of income distribution* (see Chapter 16, Section 16.6). In equilibrium, each factor of production receives a payment equal to its marginal revenue product. The more factors of production a person owns, the more productive those factors are, and the higher the price the output that can be produced with those factors can be sold for, the higher the person's income will be.

The most important factor of production that most people own is their labor. Therefore, the income they earn depends on how productive they are and on the prices of the goods and services their labor helps produce. Baseball player Max Scherzer earned a salary of $43.3 million in 2023 because he is a very productive player, and his employer at the time he signed his contract, the New York Mets, could sell tickets and television, radio, and streaming rights to the baseball games Scherzer played in for a high price. Individuals who help to produce goods and services that can be sold for only a low price earn lower incomes.

Human capital The accumulated knowledge and skills that workers acquire from education and training or from their life experiences.

A person's productivity depends in part on his or her **human capital**, which refers to the accumulated knowledge and skills that workers acquire from education and training or from their life experiences. Human capital is not equally distributed across workers. For example, some people have degrees in software engineering that prepare them for high-paying jobs, while other people drop out of high school and are prepared primarily for lower-paying jobs.

Many people own other factors of production beyond their labor. For example, many people own capital by owning stock in corporations or by owning shares in mutual funds or exchange-traded funds (ETFs) that buy the stock of corporations. Ownership of capital is not equally distributed, and income earned from capital is more unequally distributed than income earned from labor. Some people supply entrepreneurial skills by starting and managing businesses. Their income is increased by the profits from these businesses.

The Effects of Technological Change and International Trade We saw in Table 17.6 that income inequality has increased during the past 30 years. Two factors that appear to have contributed to this increase are technological change and expanding international trade. As we saw in Chapter 16, Section 16.3, rapid technological change, particularly the development of information technology and artificial intelligence, has led to the substitution of robots, chatbots, and other technology for unskilled and semiskilled workers, including some salespeople, office workers, and factory workers. The new technologies have been complements to other workers, including professionals, managers, and software engineers, increasing their productivity. As a result, there has been a decline in the wages of many unskilled and semi-skilled workers relative to the wages of more highly skilled workers.

Economists Lawrence Katz and Claudia Goldin of Harvard University argue that over the long run, income inequality in the United States has been driven by a race between technological change, which destroys unskilled jobs and increases the returns to skilled jobs, and education, which prepares workers for skilled jobs. Rising educational attainment between 1910 and the 1970s narrowed the income distribution by reducing the relative wages of skilled workers. Educational attainment in the United States since the 1970s has increased more slowly, leading to rising relative wages of skilled workers.

Expanding international trade has put some U.S. workers, such as those in many manufacturing industries, in competition with foreign workers to a greater extent than in the past. This competition has caused the wages of some unskilled workers to decline relative to the wages of workers who do not face this competition. Some economists have also argued that the incomes of some unskilled workers have been depressed by competition with workers who have immigrated to the United States.

The Effects of Assortative Mating Some economists have noted an increase in assortative mating that may have increased income inequality. *Assortative mating* refers to marriages between people with similar educations. Research by Jeremy Greenwood of the University of Pennsylvania and colleagues, as well as Pierre-André Chiappori of Columbia University and colleagues, show that the tendency for men and women of similar educational backgrounds to marry has increased substantially since 1960. Assortative mating increases income inequality across households because, as we saw in Chapter 16, Section 16.3, people with more years of education tend to earn higher incomes.

To take a simple example of assortative mating, consider two women, one with a master's degree in engineering who has an income of $125,000 per year and one who dropped out of high school and has an income of $25,000 per year; and two men, one with a master's degree and an income of $125,000 and one a high-school dropout with an income of $25,000. If the man and woman with master's degrees marry each other and the two high-school dropouts marry each other, one household will have an income of $250,000 per year, and the other will have an income of $50,000 per year. But if the two people with master's degrees each marry one of the high-school dropouts, the two households will each have incomes of $150,000. Greenwood and colleagues estimated that, in 2005, if people had married each other without regard to educational background, the Gini coefficient measure of income inequality would have been reduced from 0.45 to 0.34, a reduction of almost 25 percent.

Luck Finally, as with everything else in life, earning an income is subject to good luck and bad luck. A person who becomes a millionaire by winning the state lottery is an obvious example, as is a person whose earning power drastically declines as a result of a debilitating illness or accident.

So, we can say that as a group, people with high incomes are likely to have greater-than-average human capital, and, therefore, greater-than-average productivity, are likely to be married to someone with similarly greater-than-average levels of human capital, and are likely to own greater-than-average amounts of capital. They are also likely to have experienced good luck. As a group, people with low incomes are likely to have lower-than-average levels of human capital, to be married to someone with lower-than-average levels of human capital, and to own lower-than-average amounts of capital. They are also likely to have been unlucky.

Policies to Reduce Income Inequality

The factors that determine income distribution are complex and not easily affected by government policies. Some economists and policymakers have concluded that attempts by the federal government to reduce income inequality are likely to be ineffective and may even be counterproductive if the policies slow the rate of economic growth, thereby limiting gains for workers with low incomes. Nevertheless, policymakers and economists have made a number of proposals aimed at reducing income inequality.

Reducing Inequality through Taxes and Transfers As Figure 17.9 shows, federal tax and transfer programs already have a significant effect on the distribution of income. Some policymakers and economists argue that the after-tax distribution of income could be made more equal if the top marginal tax rate were to rise from the current 37 percent closer to the 70 percent rate that prevailed prior to 1980. (Because this rate applied to very high incomes and because the tax code contained additional deductions that have since been eliminated, many fewer people used to pay this top marginal rate than pay the top rate today.) People with higher incomes are more likely than people with lower incomes to own assets, such as stocks and bonds, and the returns people receive on their financial assets often receive favorable tax treatment. For example, people who own stock in corporations receive dividend payments and earn *capital gains* if they sell the stock for a profit. Both dividends and capital gains are taxed at rates that are lower than the top marginal individual income tax rates. Raising taxes on dividends and capital gains could potentially reduce the after-tax inequality of incomes.

Other economists and policymakers are skeptical of the idea that raising taxes is an efficient way to reduce income inequality. These economists argue that higher marginal tax rates will discourage work, saving, and investment, thereby slowing economic growth and increases in incomes for all groups. Similarly, they argue that higher taxes on dividends and capital gains will reduce incentives to save and invest. They also argue that past periods of high marginal tax rates have seen people with higher incomes devote time and money to *tax avoidance*, which involves searching for provisions of the tax code that will allow individuals to reduce their tax payments. Resources spent on tax avoidance add to the excess burden of the tax code.

As we've seen, in 2018, Congress reduced the tax rate that many small business owners, as sole proprietors, pay on their business earnings. Reducing this rate provides incentives for people to open new businesses and helps provide the funds to expand existing businesses. Tax simplification, which involves reducing the complexity of the tax code, would reduce recordkeeping and other administrative costs, which are a particularly significant burden on small businesses. As we saw in Chapter 8, Section 8.1, during the past few years, the United States has experienced an increase in the number of small businesses opening each year, partially reversing what had been a long-run downward trend. Because unskilled workers are more likely to be hired by small businesses, policies that strengthen small businesses may help reduce income inequality. In addition, licensing requirements imposed by state and local governments have made it difficult for some workers to enter occupations that would increase their earnings.

Because of exemptions and deductions, the lower 40 percent of the income distribution does not pay the federal individual income tax. But all workers must pay the payroll taxes that fund the Social Security and Medicare programs from the first dollar they earn. Some policymakers and economists have advocated reducing the federal payroll tax to boost the after-tax incomes of workers with lower incomes. Others have proposed an increase in the Earned Income Tax Credit, which provides a refundable tax credit to workers with low incomes.

Reducing Inequality through Improvements in Human Capital Workers who acquire skills that are complementary to the new technologies being developed are likely to find jobs that pay higher wages. For example, as we saw in Chapter 16, as mining company Rio Tinto introduced robots into its iron ore mines, it increased its demand for workers with the skills to service and program the robots. Policymakers in both political parties have proposed expanding enrollment in community colleges and in apprenticeship programs to increase the number of workers with technical training. Apprenticeship programs are typically sponsored by firms that seek workers with particular skills. These programs have long played an important part in worker training in some countries, including Germany and the United Kingdom. They have been less popular among workers and firms in the United States. The recent policy proposals are attempts to increase participation in these programs.

Other policymakers have focused on ensuring that workers obtain basic skills through improvements in K–12 education, particularly in low-income urban areas.

Some proposals have focused on expanding preschool programs to provide low-income children with skills that can help them succeed in kindergarten and later grades. Research showing that children from single-parent households are less likely to finish high school or acquire basic skills has led some policymakers to propose programs aimed at providing support to these households.

Economists have not arrived at a consensus about what has caused the increase in income inequality or about the likely effects of the proposals that have been made to reverse the increase. Policymakers will undoubtedly continue to have spirited debates over these policies.

Apply the Concept

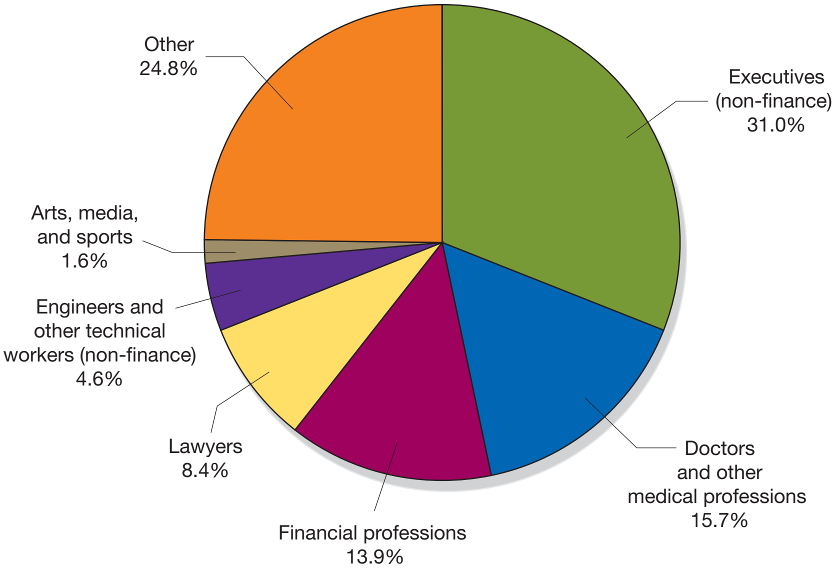
Who Are the 1 Percent, and How Do They Earn Their Incomes?

In recent years, concerns about increasing inequality have often focused on the top 1 percent of the income distribution. During 2012, the "Occupy Wall Street" movement, which held demonstrations against income inequality in New York and other cities, used the slogan "We are the 99%" to indicate what they saw as the unfair advantages the 1 percent received at the expense of the rest of the population. The French economist Thomas Piketty's book *Capital in the Twenty-First Century* received considerable publicity due to the author's controversial analysis of income inequality and, in particular, the rise in the share of income earned by people at the top of the income distribution.

In 2023, an annual income from all sources of about $787,000 was necessary to be in the top 1 percent of all households in the United States. Some economists and policymakers argue that the top 1 percent has been earning an increasing share of total income. For instance, Thomas Piketty of the Paris School of Economics and Emmanuel Saez and Gabriel Zucman of the University of California, Berkeley, estimate that, after taking into account the effect of taxes, the 1 percent's share of total income more than doubled from 9 percent in 1960 to 20 percent in 2019. But these estimates depend on what types of income are included in the analysis and on estimates of the total taxes this group pays. Gerald Auten of the U.S. Treasury Department and David Splinter of the Congressional Joint Committee on Taxation argue that Piketty, Saez, and Zucman have relied too heavily on a narrow definition of income and haven't accounted for all of the taxes the 1 percent pay. Auten and Splinter's alternative calculation results in the share of total income earned by 1 percent hardly increasing—from 8.0 percent in 1960 to 8.7 percent in 2019. Further research may be necessary before economists arrive at a consensus on this issue.

As with any other income group, the same people are not in the top 1 percent of income earners every year. Each year some people rise into the group, and some people fall out of it. Thomas Hirschl of Cornell University and Mark Rank of Washington University in St. Louis have used data from the Panel Study of Income Dynamics, which is compiled by the Survey Research Center at the University of Michigan, to track the incomes of individuals over time. Hirschl and Rank examined data on a sample of people between the ages of 25 and 60 during the years between 1968 and 2011. During this period, 11 percent of the people in the sample spent at least one year earning an income that put them in the top 1 percent of the income distribution. These results indicate that there is more turnover among the 1 percent than many policymakers had thought.

The typical occupations of people in the top 1 percent have been part of the debate over income inequality and have influenced the discussion about possible policy measures that Congress and the president might take to reduce it. Some policymakers and economists have argued that investment bankers and other people working for financial firms dominate the top 1 percent of income earners in the United States. However, the following figure, which reflects research by Jon Bakija of Williams College, Adam Cole of the Treasury Department, and Bradley T. Heim of Indiana University, shows that executives and managers of nonfinancial firms are the largest group in the top 1 percent (31 percent), and doctors and other medical professionals are the second-largest group (16 percent). Financial professionals are only the third-largest group (14 percent).



Some policymakers have proposed reducing income inequality by increasing taxes on capital gains, which represent increases in prices of assets, such as stocks or bonds. Currently, capital gains are taxed at lower rates than are wages and salaries. A CBO analysis of tax data showed, however, that earnings from capital gains are not the primary source of income for the top 1 percent:

- About one-quarter of the income of the top 1 percent is typically in the form of capital gains.
- About two-thirds of the income of the top 1 percent is in the form of wages and salaries or income from operating a business.
- The amount of income the top 1 percent earned from operating a business increased from 14 percent in 1979 to 23 percent in 2019, indicating that entrepreneurial activity has become a more important way of generating a high income, rather than a less important way, as some policymakers have argued.

Some households with high incomes, such as members of the Walton family (heirs to Sam Walton, founder of Walmart), earn most of their income from the return on inherited wealth. However, research by Steven Kaplan of the University of Chicago and Joshua Rauh of Stanford University has shown that those who are currently wealthy are much *more* likely to be the first in their family to run a firm and much *less* likely to have been born into a wealthy family than was true in the 1980s.

The debate over the top 1 percent will undoubtedly continue to be a particularly contentious part of the larger debate on income inequality in the United States.

Your Turn: Test your understanding by doing related problem 4.15 at the end of this chapter.

Poverty around the World

Although poverty remains a problem in high-income countries, it is a much larger problem in low-income countries. The level of poverty in much of sub-Saharan Africa, in particular, is a human catastrophe. In 2023, the poverty line in the United States for a family of four was an annual income of $30,000, but economists often use a much lower threshold income when calculating the rate of poverty in poor countries. For example, the World Bank, an international organization focused on promoting economic development, uses income thresholds of $2.15, $3.65, and $6.85 *per day* to define different levels of poverty. Figure 17.10 shows the World Bank's estimates of changes in poverty in different regions, using the $3.65 per day threshold. Between 1990 and 2019, the fraction of the world's population living in poverty declined from more than half to less than a quarter.

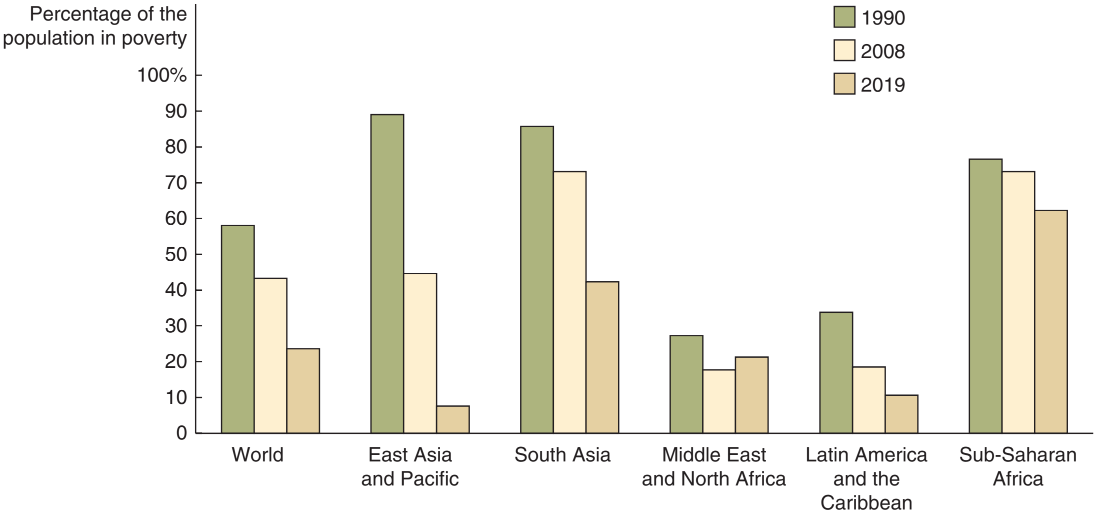


Figure 17.10 **Poverty Has Declined Dramatically around the World since 1990**

The World Bank uses the income threshold of $3.65 a day to estimate changes in poverty in different regions. Between 1990 and 2019, the fraction of the world's population living in poverty declined from more than half to about a quarter. The greatest reduction in poverty has taken place in East Asia, including China. South Asia, including India, has also made substantial progress in reducing poverty. Progress has been slower in sub-Saharan Africa and in the Middle East and North Africa.

Note: The most recent value for the Middle East and North Africa is 2018.

Source: World Bank, *Poverty and Inequality Indicators*, March 2023.

The greatest reduction in poverty has taken place in East Asia, including China, where a large majority of people were in poverty in 1990, while many fewer are in poverty today. This decline in poverty reflects the rapid growth rates in China after it moved away from a centrally planned economy by introducing market reforms, beginning in the 1970s. South Asia, including India, has also made substantial progress in reducing poverty. Progress has been slower in sub-Saharan Africa, where more than 60 percent of the population was still in poverty in 2019. Why has poverty fallen more dramatically in Asia than in sub-Saharan Africa? The key explanation is that the countries of Asia have had higher rates of economic growth than have the countries of sub-Saharan Africa. Recent economic research demonstrates that economic growth is the key to raising the incomes of people with lower incomes.

Continued from chapter opener

Economics in Your Life & Career

Which Is Better: A $1,000 Raise or $1,000 toward Health Insurance?

At the beginning of this chapter, we asked you to suppose that you own a bike shop and that you are thinking of increasing your employees' compensation by $1,000 per year to make it more competitive with what other local bike shops are paying. We asked you to explain why one of your employees requests the $1,000 in the form of a reduction in what she has to pay for the health insurance you provide rather than as salary.

We saw in the chapter that in order to encourage firms to offer health insurance, the federal government does not tax employees on the amount that employers spend providing them with health insurance. So, the employee realizes that if she receives the $1,000 as salary, she will have to pay tax on that amount, but if you spend the $1,000 to reduce her health insurance premiums, the government won't tax the increase in her compensation. This example is one of many ways in which Congress uses the tax code to achieve social objectives, thereby increasing its complexity.

Conclusion

A saying attributed to Benjamin Franklin is that “nothing in this world is certain but death and taxes.” But which taxes? The tax system represents a balance among the principles of economic efficiency, ability to pay, payment for benefits received, and achievement of social objectives. As we saw in Chapter 1, policymakers often face a trade-off between economic efficiency and equity. Ultimately, whether the tax code should be used to pursue policies such as reducing income inequality is a normative question. Economics alone cannot decide the issue.

CHAPTER SUMMARY AND PROBLEMS

Key Terms

Arrow impossibility theorem, p. 599
Average tax rate, p. 606
Excess burden, p. 607
Human capital, p. 620
Lorenz curve, p. 616
Marginal tax rate, p. 606
Median voter theorem, p. 599
Poverty line, p. 615
Poverty rate, p. 615
Progressive tax, p. 604
Public choice model, p. 598
Regressive tax, p. 604
Rent seeking, p. 600
Tax incidence, p. 611
Voting paradox, p. 599

17.1 Public Choice

LEARNING OBJECTIVE: Describe the public choice model and use it to analyze government decision making.

Summary

The **public choice model** applies economic analysis to government decision making. The observation that majority voting may not always result in consistent choices is called the **voting paradox**. The **Arrow impossibility theorem** states that no system of voting can be devised that will consistently represent the underlying preferences of voters. The **median voter theorem** states that the outcome of a majority vote is likely to represent the preferences of the voter who is in the political middle. Individuals and firms sometimes engage in **rent seeking**, which is the use of government action to make themselves better off at the expense of others. Although government intervention can sometimes improve economic efficiency, public choice analysis indicates that *government failure* can also occur, reducing economic efficiency.

Review Questions

1.1 What is the public choice model?
1.2 What is the difference between the voting paradox and the Arrow impossibility theorem?
1.3 What is rent seeking, and how is it related to regulatory capture?
1.4 What is the relationship between market failure and government failure?

Problems and Applications

1.5 Will the preferences shown in the following table lead to a voting paradox? Briefly explain.

Voter	First Choice	Second Choice	Third Choice
Lena	Cancer research	Mass transit	Pandemic preparedness
David	Mass transit	Cancer research	Pandemic preparedness
Kathleen	Mass transit	Pandemic preparedness	Cancer research

1.6 Many political observers have noted that Republican presidential candidates tend to emphasize their conservative positions on policy issues while running for their party's nomination, and Democratic presidential candidates tend to emphasize their liberal positions on policy issues while running for their party's nomination. In the general election, though, Republican candidates tend to downplay their conservative positions, and Democratic candidates tend to downplay their liberal positions.

a. Can the median voter theorem help explain this pattern? Briefly explain.
b. A columnist at *New York Magazine* commenting on the 2020 presidential campaign observed: "For obvious reasons, the median voter theorem is unpopular among ideologues in both parties." What does the columnist mean by "ideologues"? Why would the median voter theorem be unpopular with ideologues?

1.7 A columnist in the *Wall Street Journal* writing about Britain's energy security plan claimed that "elected leaders have incentives to lean toward short-term, partisan thinking." The columnist argued that although the energy plan:

> contained some much-needed initiatives to streamline approvals for offshore wind farms and accelerate investments in energy efficiency . . . it also focused too much on shiny new infrastructure projects to be built many years from now, while avoiding more contentious solutions that could be delivered much sooner.

a. What is "short-term partisan thinking"? Why might elected leaders, such as members of the British Parliament or the U.S. Congress, "have incentives to lean toward short-term, partisan thinking"? Briefly explain.
b. Why would elected representatives tend to endorse "infrastructure projects to be built many years from now" over solutions that could be delivered sooner but that might be controversial?

1.8 Briefly explain whether you agree with the following argument:

> The median voter theorem will be an accurate predictor of the outcomes of elections when a majority of voters have preferences very similar to those of the median voter. When the majority of voters have preferences very different from those of the median voter, the median voter theorem will not lead to accurate predictions of the outcomes of elections.

1.9 An article in the *Economist* summarizes the views of a public opinion pollster: "What looks like a failure of median-voter theory is often a failure of commentators to spot where the true median lies."

- **a.** What does the pollster mean by the "median-voter theory"?
- **b.** Why might commentators who fail to understand the opinion of the actual median voter believe that they have demonstrated a failure of the median-voter theorem?

1.10 An article in the *Economist* on the work of Nobel Laureate James Buchanan made the following observation: "It was important . . . to understand the ways that government could fail systematically."

- **a.** What does *government failure* mean in this context? How does public choice theory help us understand how "government could fail systematically"?
- **b.** The same article noted that "rent-seeking is a very useful concept to have around when thinking about policy." What is rent seeking? Why is the concept useful when thinking about policy?

1.11 A book review in the *Wall Street Journal* quotes economics writer Robert Skidelsky: "The question, of course, is not whether government always succeeds but whether government failure is likely to be greater or lesser than the market failures it seeks to correct."

- **a.** What does Skidelsky mean by "market failure," and what does he mean by "government failure"?
- **b.** Give an example of a market failure and an example of how a government policy might succeed or fail in correcting the market failure.

1.12 A columnist for the *Washington Post* observed, "Over the decades, Congress had raised so many tariffs on imports in a frenzy of logrolling . . . ."

- **a.** Briefly explain what the columnist means by "logrolling."
- **b.** Why was logrolling often necessary when members of Congress were negotiating over raising tariffs? Wouldn't members of Congress vote only for tariffs that they believe are in the economic interest of firms and workers in their districts? Briefly explain.

1.13 An article describing the work of Nobel Laureate James Buchanan observed, "Buchanan and other public choice theorists altered the debate by proposing that government may not really correct problems in the marketplace because of the wealth trading, or rent seeking, that occurs during the legislative process." The same article included the following statement by Buchanan: "I was greatly influenced by Knut Wicksell's admonition that economists cease acting as if government were a benevolent despot."

- **a.** Explain why James Buchanan and other public choice economists believed that government policymakers do not act as "benevolent despots."
- **b.** Why would "rent seeking" be an impediment to government attempts to correct "problems in the marketplace"?

17.2 The Tax System

LEARNING OBJECTIVE: Explain the tax system in the United States, including the principles that governments use to create tax policy.

Summary

Governments raise the funds they need through taxes. The most widely used taxes are income taxes, social insurance taxes, sales taxes, property taxes, and excise taxes. Governments take into account several important objectives when deciding which taxes to use: efficiency, ability to pay, horizontal equity, benefits received, and attaining social objectives. A **regressive tax** is a tax for which people with lower incomes pay a higher percentage of their incomes in tax than do people with higher incomes. A **progressive tax** is a tax for which people with lower incomes pay a lower percentage of their incomes in tax than do people with higher incomes. The **marginal tax rate** is the fraction of each additional dollar of income that must be paid in taxes. The **average tax rate** is the total tax paid divided by total income. When analyzing the effect of taxes on how much people are willing to work, save, or invest, economists focus on the marginal tax rate rather than the average tax rate. The **excess burden** of a tax is the efficiency loss to the economy that results from a tax having reduced the quantity of a good produced.

Review Questions

2.1 What is the largest source of revenue for the federal government? What is the largest source of revenue for state and local governments?

2.2 What is the difference between a *progressive tax* and a *regressive tax*? Give an example of each.

2.3 What is the difference between a marginal tax rate and an average tax rate? Which is more important in determining the effect of a change in taxes on economic behavior?

2.4 Briefly discuss each of the five goals and principles governments consider when deciding which taxes to use.

Problems and Applications

2.5 An article in a Federal Reserve publication noted that "nearly all taxes create some market inefficiency in the form of deadweight loss." The article further noted that when something is taxed, the result is "an outcome in which both [buyers and sellers] would gain from more production."

- **a.** Briefly explain why taxes result in deadweight loss.
- **b.** If buyers and sellers would gain from more production of a good or service that is taxed, why doesn't more of the good or service get produced?"

2.6 New York City charges an 8.75 percent tax on sandwiches made from two slices of bread with meat or other food between the slices, including hot dogs, wraps, burritos, and sliced bagels with cream cheese. In April 2023, H&H Bagels, with several locations in the city, found a way around the tax. They convinced the makers of Philadelphia cream cheese to provide them with bagels injected with cream cheese. Because the bagels aren't sliced, they aren't subject to the sandwich tax. Even though the city doesn't collect the sandwich tax on these bagels, might the tax still be imposing a deadweight loss on consumers who purchase these bagels? Briefly explain.

2.7 Many states have begun raising revenue by operating lotteries rather than through direct taxes. According to an article on bloomberg.com, "The lowest-income households in the U.S. on average spend $412 annually on lottery tickets, which is nearly four times the $105 a year spent by the highest-earning households."

a. In what sense is a state-run lottery like a tax?

b. If a lottery can be thought of as a tax, is it regressive or progressive? Briefly explain.

2.8 The federal government imposes a tax on sales of cigarettes. The federal Centers for Disease Control and Prevention compiled the data shown in the following table.

Annual Household Income	Percentage of Adults Who Are Current Cigarette Smokers, 2020
Less than $35,000	20.2%
$35,000 to $74,999	14.1
$75,000 to $99,999	10.5
$100,000 or greater	6.2

Based on these data, is the federal cigarette tax progressive or regressive? Be sure to define *progressive tax* and *regressive tax* in your answer.

2.9 Use the information in Table 17.2 to calculate the total federal income tax paid, the marginal tax rate, and the average tax rate for people with the following incomes. (For simplicity, assume that these people have no exemptions or deductions from their incomes.)

a. $25,000

b. $125,000

c. $300,000

2.10 Use the following table to answer the questions.

Annual Income	Tax Liability
$15,000	$0
30,000	4,500
45,000	11,250
60,000	21,000
75,000	30,000

a. What is the average tax rate at each income level?

b. Based on these data, is the tax progressive or regressive? Briefly explain.

c. Is it possible to determine, based on these data, the marginal tax rate of someone earning $65,000 per year? Briefly explain.

2.11 **[Related to the Apply the Concept "Which Groups Pay the Most in Federal Taxes?"]** In a speech in April 2023, President Joe Biden argued that it was time for people with high incomes to "start paying a fair share" of the taxes the federal government collects. Biden was also pushing a proposal he labeled a "billionaire minimum tax." This proposal is sometimes called the Buffett Rule, named after billionaire Warren Buffett, who once noted that he was paying a lower tax rate than his secretary.

a. How can we decide whether a particular income group is paying its fair share of taxes? What factors would you take into account in deciding?

b. Looking at the table in the *Apply the Concept* feature for the percentage of federal taxes paid by the different income categories, is Mr. Buffett's situation of paying a lower tax rate than his secretary typical of the highest 1 percent of U.S. income earners?

c. According to an article in the *New York Times*, Buffett's "income comes mostly from his investments, which are taxed at the capital gains rate of 15 percent. His secretary is most likely paid a salary and bonus, which would be taxed as ordinary income, at a rate that goes as high as 35 percent." What are capital gains? Which goals and principles of evaluating taxes are relevant to considering whether the federal government should continue to tax capital gains at a lower rate than ordinary income? Briefly explain.

2.12 Currently, the Social Security and Medicare programs are funded by payroll taxes rather than by the federal personal income tax. In 2023, the payroll tax for Social Security was 12.4 percent on wage, salary, and self-employment income up to $160,200. (Half of the tax is collected from employers and half from employees.) Above that income level, the tax dropped to zero. The Medicare tax was 2.9 percent on all wage, salary, and self-employment income. Some economists and policymakers have proposed eliminating the payroll tax and shifting to funding Social Security and Medicare out of the federal personal income tax. Would this proposal make the federal income tax system as a whole more progressive or less progressive? Briefly explain.

2.13 **[Related to the Economics in Your Life & Career]** An opinion column in the *Wall Street Journal* argues that "companies that buy health insurance on behalf of workers are, in effect, giving them some of their compensation in the form of benefits. But employers get to use pretax dollars when they purchase this insurance. If workers try to buy their own policies, most don't get the same tax break."

a. What is "pretax income"?

b. Does the current tax break for employer-provided health insurance likely make the overall tax system more progressive or more regressive? Briefly explain.

2.14 **[Related to the Economics in Your Life & Career]** An article in the *Wall Street Journal* reports on a survey by the Kaiser Family Foundation showing that in 2022, the average cost of an employer-provided health insurance plan for a family was $22,463. The article notes that "employees paid $6,106 of the total this year, with the rest of the cost [$16,357] borne by the employers."

a. Would the typical employee enrolled in an employer-provided health insurance plan be better off with a raise in salary of $16,357 instead of being provided with health insurance coverage? Briefly explain.

b. Is there a sense in which employees are actually paying both the employer and the employee shares of the cost of employer-provided health insurance plans? Briefly explain. (You may find it helpful to review the discussion in Chapter 7, Section 7.3.)

2.15 **[Related to the Apply the Concept "Should the Federal Government Begin to Tax Wealth?"]** Vermont Senator Bernie Sanders has proposed the following wealth tax (note that a person's *net worth* is the same as a person's wealth):

> It would start with a 1 percent tax on net worth above $32 million for a married couple. . . . The tax rate would increase to 2 percent on net worth from $50 to $250 million, 3 percent from $250 to $500 million, 4 percent from $500 million to $1 billion, 5 percent from $1 to $2.5 billion, 6 percent from $2.5 to $5 billion, 7 percent from $5 to $10 billion, and 8 percent on wealth over $10 billion.

a. Briefly explain the difference between income and wealth.
b. Compare and contrast a progressive income tax and a wealth tax in terms of the goals and principles of taxation discussed in this chapter.

17.3 Tax Incidence Revisited: The Effect of Price Elasticity

LEARNING OBJECTIVE: Explain the effect of price elasticity on tax incidence.

Summary

Tax incidence is the actual division of the burden of a tax. In most cases, buyers and sellers share the burden of a tax levied on a good or service. When the elasticity of demand for a product is smaller in absolute value than the elasticity of supply, consumers pay the majority of the tax on the product. When the elasticity of demand for a product is larger in absolute value than the elasticity of supply, sellers pay the majority of the tax on the product.

Review Questions

3.1 What does *tax incidence* mean?
3.2 Briefly discuss the effect of price elasticity of supply and demand on tax incidence.

Problems and Applications

3.3 **[Related to the Don't Let This Happen to You]** If you sell a house or an apartment in New York State, you must pay a real estate transfer tax. According to the New York State government's website, the tax is "paid by the grantor (seller), and such tax shall not be paid directly or indirectly by the grantee (buyer)." Does this statement mean that the real estate transfer tax does not impose a burden on the buyer of a house or an apartment in New York? Briefly explain.

3.4 **[Related to the Apply the Concept "Do Corporations Really Bear the Burden of the Federal Corporate Income Tax?"]** A column on the website of the Tax Foundation notes that an increase in the corporate income tax "would burden taxpayers across the income spectrum, not just the wealthy, as labor bears a significant portion of the corporate income tax." If corporations, not workers, pay the corporate income tax, how can labor (workers) bear a significant portion of the tax?

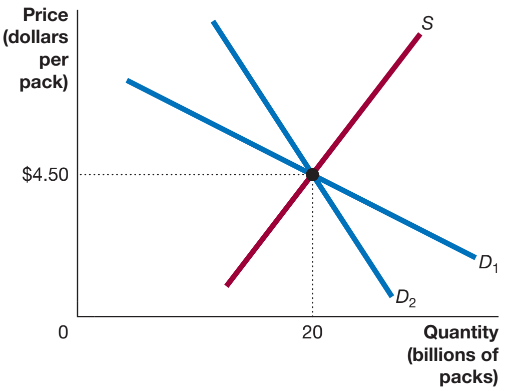
3.5 **[Related to the Apply the Concept "Do Corporations Really Bear the Burden of the Federal Corporate Income Tax?"]** Business historian John Steele Gordon noted in a *Wall Street Journal* column that the first federal corporate income tax was enacted in 1909, before passage of the Sixteenth Amendment made a federal income tax constitutional. According to Gordon, Congress enacted the corporate income tax because of "the political pressure to tax the rich." Is the corporate income tax an efficient means of taxing the rich? Briefly explain.

3.6 **[Related to the Chapter Opener]** In 2023, as President Joe Biden was proposing an increase in the corporate income tax rate from 21 percent to 28 percent, Kate Bachelder Odell, a member of the *Wall Street Journal*'s editorial board, observed in a podcast: "You can argue about how much, but the rise in the corporate tax, the incidence of that falls on labor." In other words, Odell described the tax increase as a wage reduction.
a. Briefly explain what Odell means by saying that an increase in the corporate income tax "falls on labor."
b. What other factors, beyond the incidence of the tax, might be relevant in assessing whether an increase in the corporate income tax is desirable or undesirable compared with raising other taxes?

3.7 According to an article in the *New York Times*, when the French government imposed a new tax on sales of beer, it estimated that the retail price of beer would rise by the equivalent of 6 cents per half pint. A spokesman for the beer industry argued that the actual increase in price would be 25 cents per half pint. Discuss the differences between the French government's estimate and the beer industry's estimate of the price elasticity of demand for beer.

3.8 Governments often have multiple objectives in imposing a tax. In each part of this question, use a demand and supply graph to illustrate your answer.
a. If the government wants to minimize the excess burden from excise taxes, should these taxes be imposed on goods that have price-elastic demand or on goods that have price-inelastic demand?
b. Suppose that rather than minimizing excess burden, the government is most interested in maximizing the revenue it receives from the tax. In this situation, should the government impose excise taxes on goods that have price-elastic demand or on goods that have price-inelastic demand?
c. Suppose that the government wants to discourage smoking and drinking alcohol. Will a tax be more effective in achieving this objective if the demand for these goods is price elastic or if the demand is price inelastic?

3.9 [**Related to Solved Problem 17.3**] Use the following graph of the market for cigarettes to answer the questions.



a. If the government imposes a 10-cents-per-pack tax on cigarettes, will the price consumers pay rise more if the demand curve is D_1 or if the demand curve is D_2? Briefly explain.

b. If the government imposes a 10-cents-per-pack tax on cigarettes, will the revenue the government collects be greater if the demand curve is D_1 or if the demand curve is D_2? Briefly explain.

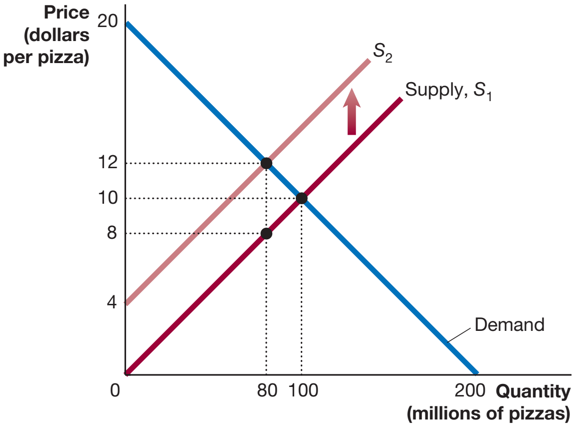
c. If the government imposes a 10-cents-per-pack tax on cigarettes, will the excess burden from the tax be greater if the demand curve is D_1 or if the demand curve is D_2? Briefly explain.

3.10 [**Related to Solved Problem 17.3**] We saw in Chapter 4, Solved Problem 4.4 that Seattle levies a tax on soda of 1.75 cents per ounce. A report prepared by Jesse Jones-Smith of Washington University in St. Louis and Nadine Chan of the Seattle Department of Public Health found that the price of soda increased by 1.70 cents per ounce following the imposition of the tax.

a. Briefly explain what this result tells us about the size of the price elasticity of demand for soda in Seattle relative to the price elasticity of supply.

b. Suppose that the price of soda had increased by only 0.20 cents per ounce following the imposition of the tax. Would the excess burden of the tax have been smaller or larger than the excess burden that resulted from the price increasing by 1.70 cents per ounce? Illustrate your answer with a graph that shows the size of the excess burden in each case.

3.11 Suppose the government decides to tax sales of pizzas. Use the following graph to answer the questions.



a. How much is the per-unit tax the government imposed on pizzas?

b. Before the tax, what price do consumers pay for pizza? How does the price consumers pay change after the tax?

c. Before the tax, what price do sellers receive? How does the price sellers receive change after the tax?

d. Are consumers or producers bearing more of the burden of this tax? Briefly explain.

17.4 Income Distribution and Poverty

LEARNING OBJECTIVE: Discuss income distribution and income mobility and the role of policy in addressing these issues.

Summary

In the United States, there was a decline in income inequality between 1936 and 1980, and there has been an increase in income inequality between 1980 and today. A **Lorenz curve** shows the distribution of income by arraying incomes from lowest to highest on the horizontal axis and indicating the cumulative fraction of income earned by each fraction of households on the vertical axis. In 2023, about 12 percent of Americans were below the **poverty line**, which is defined as annual income equal to three times the amount necessary to purchase the minimum quantity of food required for adequate nutrition. Over time, there has been significant income mobility in the United States. The *marginal productivity theory of income distribution* states that in equilibrium, each factor of production receives a payment equal to its value of marginal product. The more factors of production an individual owns and the more productive those factors are, the higher the individual's income will be. **Human capital** is the accumulated knowledge and skills that workers acquire from education and training or from their life experiences. Economists and policymakers have been debating policies to reduce income inequality. The **poverty rate**—the percentage of the population that is poor—has been declining rapidly in most regions of the world, although the decline has been slower in sub-Saharan Africa than in other regions.

Review Questions

4.1 Discuss the extent of income inequality in the United States. Has inequality in the distribution of income in the United States increased or decreased over time? Briefly explain.

4.2 Define *poverty line* and *poverty rate*. How has the poverty rate changed in the United States since 1960?

4.3 What is a Lorenz curve? What is a Gini coefficient? If a country had a Gini coefficient of 0.48 in 1960 and 0.44 in 2024, would income inequality in the country have increased or decreased?

4.4 Describe the main factors economists believe cause income inequality.

4.5 Describe the trend in global poverty rates.

Problems and Applications

4.6 **[Related to the Chapter Opener]** In a column in the *Washington Post*, Roger Lowenstein wrote:

> Raising mobility should be a priority—and as a guide to policy, it is less controversial, and less politicized, than [reducing] inequality. . . . But taxing the wealthy to pay for social goods [such as improved schooling] is different from targeting the [income] gap . . . as the problem. One approach uses government to level, the other to promote opportunity and advancement.

a. What is social mobility? Briefly explain whether you agree that increasing social mobility is likely to be a less controversial policy goal than reducing income inequality.

b. What does Lowenstein mean by using the government to "level"? How can the government use taxes to target income inequality?

4.7 A column by Christopher Mims in the *Wall Street Journal* summarized academic research showing that some firms in the same industry have become much more productive than other firms. As we saw in Chapter 16, Section 16.1, wages depend on the marginal productivity of labor. Mims draws the conclusion that "the rise in [income inequality] since 1978 is almost entirely attributed to an increase [in wages] at more-productive firms that occurred as pay at less-productive firms remained relatively static." If the main cause of increasing income inequality is differences in worker productivity across firms, do you believe that changes in individual income tax rates are likely to be the best way of reducing inequality? Briefly explain.

4.8 An article in the *New York Times* observed: "Income inequality is now significantly driven by well-paid college graduates marrying one another, and by poorly paid high school dropouts doing the same."

a. What term do economists use to describe people at the same educational and income levels marrying each other?

b. How can this process contribute to income inequality?

c. If this process is a major cause of income inequality, what are the likely consequences for government policies intended to reduce income inequality?

4.9 Beginning in 1983, the United States gradually raised the age to receive full Social Security retirement benefits from 65 to 67. In 2023, France started to gradually increase the age to receive full government retirement benefits from 62 to 64.

a. Is increasing the age to receive full government retirement benefits likely to make the income distribution more unequal or less unequal? What additional information would you need to be confident in your answer?

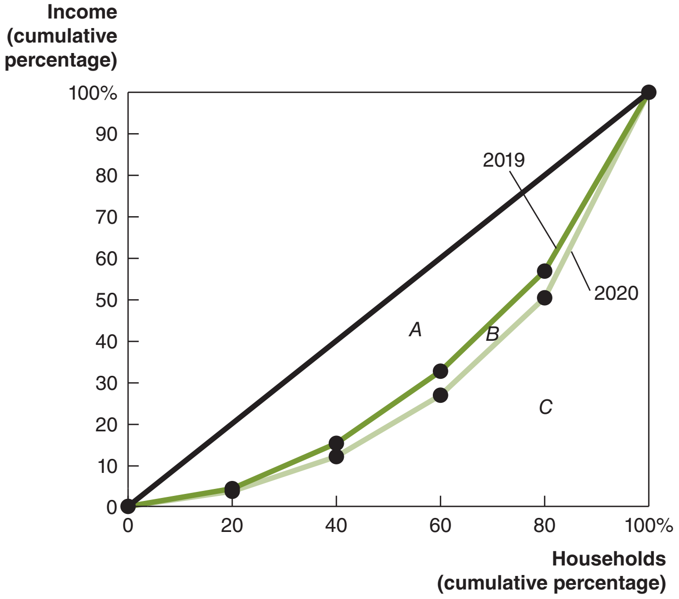
b. What effect is a higher retirement age, as in the United States, likely to have on the income distribution in comparison with a lower retirement age, as in France?

4.10 An article in the *Wall Street Journal* noted that "inequality is highly sensitive to how you . . . measure it. Nonwage income such as capital gains and dividends skews the picture toward more inequality, while taxes and government transfers skew it the other way." Charles Calomiris, of Columbia University, reviewed a book titled *The Myth of American Inequality* by former Texas Senator Phil Gramm, Robert Ekelund of Auburn University, and John Early, formerly of the U.S. Bureau of Labor Statistics. In his review, Calomiris wrote: "The equality of consumption between the bottom quintile (in which only 36% of prime-age persons work) and the middle quintile (in which 92% of prime-age persons work) is a striking finding."

a. Briefly explain why including capital gains and dividends in measures of income will tend to make the distribution of income more unequal, while including the effects of taxes and government transfer payments would "skew it the other way."

b. Why would the reviewer find it "striking" that the bottom and middle quintiles in the income distribution have equal levels of consumption? What might explain this result?

4.11 Use the following Lorenz curve graph to answer the questions.



a. Did the distribution of income become more equal in 2020 than it was in 2019, or did it become less equal? Briefly explain.

b. If area $A = 2{,}150$, area $B = 250$, and area $C = 2{,}600$, calculate the Gini coefficient for 2019 and the Gini coefficient for 2020.

4.12 Draw a Lorenz curve showing the distribution of income for the five people in the following table.

Name	Annual Earnings
Lena	$70,000
David	60,000
Steve	50,000
Jerome	40,000
Lori	30,000

4.13 In an opinion column in the *New York Times*, Mark Rank of Washington University in St. Louis described research he conducted with Thomas A. Hirschl of Cornell University. They tracked individuals between the ages of 25 and 60 over a 44-year period and found that "39 percent of Americans will spend a year in the top 5 percent of the income distribution, 56 percent will find themselves in the top 10 percent, and a whopping 73 percent will spend a year in the top 20 percent of the income distribution." Rank argues that "this information casts serious doubt on the notion of a rigid class structure in the United States based upon income."

a. What does Rank mean by a "rigid class structure . . . based upon income"?

b. Why might looking at the distribution of income in a particular year, as we do in Tables 17.5 and 17.6, give a different picture of the state of inequality in the United States than does longitudinal data that tracks individuals over time?

4.14 Evaluate the following statement: "Policies to redistribute income are desperately needed in the United States. Without such policies, the roughly 12 percent of the population that is currently poor has no hope of ever climbing above the poverty line."

4.15 **[Related to the Apply the Concept "Who Are the 1 Percent, and How Do They Earn Their Incomes?"]** Each year, *Forbes* magazine compiles a list of the 400 wealthiest Americans. An analysis of how the people on the list earned their wealth indicates that in 1984, fewer than half the people included in the Forbes 400 list were self-made—meaning that "they built their own company or established their fortune on their own." In 2021, 68.8 percent were self-made, and 7 percent of the 400 wealthiest Americans had been born in poverty. Do these findings have any implications for whether we should consider the top 1 percent of the income distribution as consisting of mostly the same people each year? Briefly explain.

4.16 Why do economists often use a lower poverty threshold for low-income countries than for high-income countries such as the United States? Is there a difference between *relative* poverty and *absolute* poverty? Briefly explain.

4.17 Suppose that a country has 20 million households. Ten million are poor households that each have labor market earnings of $20,000 per year, and 10 million are rich households that each have labor market earnings of $80,000 per year. If the government enacted a marginal tax of 10 percent on all labor market earnings above $20,000 and transferred this money to households earning $20,000, would the incomes of the poor rise by $6,000 per year? Briefly explain.

Critical Thinking Exercises

CT17.1 Using an internet search engine, find the 2014 article "Political Polarization in the American Public" from the Pew Research Center and read the introduction. At the beginning of the article, you will see three figures that each look like mountains. Do these figures imply that the median voter theorem no longer applies to the United States? Write a paragraph explaining your answer.

CT17.2 For this exercise, your instructor may assign you to a group.

a. Each person in the group should reread Section 17.2.

b. Each person should identify some point(s) in these pages that he or she finds surprising.

c. The group members should discuss with each other what they found surprising and compare their answers.

d. The group should prepare a brief report on what the group members found surprising.

GLOSSARY

A

Absolute advantage The ability of an individual, a firm, or a country to produce more of a good or service than competitors, using the same amount of resources.

Accounting profit A firm's net income, measured as revenue minus operating expenses and taxes paid.

Adverse selection The situation in which one party to a transaction takes advantage of knowing more than the other party to the transaction.

Affordable Care Act (ACA) Health care reform legislation passed by Congress and signed by President Barack Obama in 2010.

Allocative efficiency A state of the economy in which production is in accordance with consumer preferences; in particular, every good or service is produced up to the point where the last unit provides a marginal benefit to consumers equal to the marginal cost of producing it.

Antitrust laws Laws aimed at eliminating collusion and promoting competition among firms.

Arrow impossibility theorem A mathematical theorem that holds that no system of voting can be devised that will consistently represent the underlying preferences of voters.

Asset Anything of value owned by a person or a firm.

Asymmetric information A situation in which one party to an economic transaction has less information than the other party.

Autarky A situation in which a country does not trade with other countries.

Average fixed cost Fixed cost divided by the quantity of output produced.

Average product of labor The total output produced by a firm divided by the quantity of workers.

Average revenue (AR) Total revenue divided by the quantity of the product sold.

Average tax rate Total tax paid divided by total income.

Average total cost Total cost divided by the quantity of output produced.

Average variable cost Variable cost divided by the quantity of output produced.

B

Balance sheet A financial statement that sums up a firm's financial position on a particular day, usually the end of a quarter or year.

Barrier to entry Anything that keeps new firms from entering an industry in which firms are earning economic profits.

Behavioral economics The study of situations in which people make choices that do not appear to be economically rational.

Bond A financial security that represents a promise to repay a fixed amount of funds.

Brand management The actions of a firm intended to maintain the differentiation of a product over time.

Budget constraint The limited amount of income available to consumers to spend on goods and services.

Business strategy A set of actions that a firm takes to achieve a goal, such as maximizing profits.

C

Cartel A group of firms that collude by agreeing to restrict output to increase prices and profits.

Centrally planned economy An economy in which the government decides how economic resources will be allocated.

***Ceteris paribus* ("all else equal") condition** The requirement that when analyzing the relationship between two variables—such as price and quantity demanded—other variables must be held constant.

Circular-flow diagram A model that illustrates how participants in markets are linked.

Coase theorem The argument of economist Ronald Coase that if transactions costs are low, private bargaining will result in an efficient solution to the problem of externalities.

Collusion An agreement among firms to charge the same price or otherwise not to compete.

Command-and-control approach A policy that involves the government imposing quantitative limits on the amount of pollution firms are allowed to emit or requiring firms to install specific pollution control devices.

Common resource A good that is rival but not excludable.

Comparative advantage The ability of an individual, a firm, or a country to produce a good or service at a lower opportunity cost than competitors.

Compensating differential A difference in wages that compensates workers for unpleasant aspects of a job.

Competitive market equilibrium A market equilibrium with many buyers and sellers.

Complements Goods and services that are used together.

Constant returns to scale The situation in which a firm's long-run average costs remain unchanged as it increases output.

Consumer surplus The difference between the highest price a consumer is willing to pay for a good or service and the actual price the consumer pays.

Cooperative equilibrium An equilibrium in a game in which players cooperate to increase their mutual payoff.

Copyright A government-granted exclusive right to produce and sell a creation for up to 70 years after the creator's death.

Corporate governance The way in which a corporation is structured and the effect that structure has on the corporation's behavior.

Corporation A legal form of business that provides owners with protection from losing more than their investment should the business fail.

Coupon payment An interest payment on a bond.

Cross-price elasticity of demand The percentage change in the quantity demanded of one good divided by the percentage change in the price of another good.

D

Deadweight loss The reduction in economic surplus resulting from a market not being in competitive equilibrium.

Demand curve A curve that shows the relationship between the price of a product and the quantity of the product demanded.

Demand schedule A table that shows the relationship between the price of a product and the quantity of the product demanded.

Demographics The characteristics of a population with respect to age, race, and gender.

Derived demand The demand for a factor of production; it depends on the demand for the good the factor produces.

Direct finance A flow of funds from savers to firms through financial markets, such as the New York Stock Exchange.

Diseconomies of scale The situation in which a firm's long-run average cost rises as the firm increases output.

Dividends Payments by a corporation to its shareholders.

Dominant strategy The best strategy for a firm, no matter what strategies other firms use.

Dumping Selling a product for a price below its cost of production.

E

Economic discrimination The practice of paying a person a lower wage or excluding a person from an occupation on the basis of an irrelevant characteristic such as race or gender.

Economic efficiency A market outcome in which the marginal benefit to consumers of the last unit produced is equal to its marginal cost of production and in which the sum of consumer surplus and producer surplus is at a maximum.

Economic growth The ability of an economy to produce increasing quantities of goods and services.

Economic loss The situation in which a firm's total revenue is less than its total cost, including all implicit costs.

Economic model A simplified version of reality used to analyze real-world economic situations.

Economic profit A firm's revenues minus all of its implicit and explicit costs.

Economic rent (or **pure rent**) The price of a factor of production that is in fixed supply.

Economic surplus The sum of consumer surplus and producer surplus.

Economic variable Something measurable that can have different values, such as the number of people employed in manufacturing.

Economics The study of the choices people make to attain their goals, given their scarce resources.

Economies of scale The situation in which a firm's long-run average cost falls as it increases the quantity of output it produces.

Elastic demand The case where the percentage change in quantity demanded is *greater* than the percentage change in price, so the price elasticity is *greater* than 1 in absolute value.

Elasticity A measure of how much one economic variable responds to changes in another economic variable.

Endowment effect The tendency of people to be unwilling to sell a good they already own even if they are offered a price that is greater than the price they would be willing to pay to buy the good if they didn't already own it.

Entrepreneur Someone who operates a business, bringing together the factors of production—labor, capital, and natural resources—to produce goods or services.

Equity The fair distribution of economic benefits.

Excess burden A measure of the efficiency loss to the economy that results from a tax having reduced the quantity of a good produced; also known as the deadweight loss.

Excludability The situation in which anyone who does not pay for a good cannot consume it.

Explicit cost A cost that involves spending money.

Exports Goods and services produced domestically and sold in other countries.

External economies Reductions in a firm's costs that result from an increase in the size of an industry.

Externality A benefit or cost that affects someone who is not directly involved in the production or consumption of a good or service.

F

Factor market A market for the factors of production, such as labor, capital, natural resources, and entrepreneurial ability.

Factors of production Labor, capital, natural resources, and other inputs used to make goods and services.

Fee-for-service A system under which doctors and hospitals receive a payment for each service they provide.

Fixed costs Costs that remain constant as output changes.

Free market A market with few government restrictions on how a good or service can be produced or sold or on how a factor of production can be employed.

Free riding Benefiting from a good without paying for it.

Free trade Trade between countries that is without government restrictions.

G

Game theory The study of how people make decisions in situations in which attaining their goals depends on their interactions with others; in economics, the study of the decisions of firms in industries where the profits of a firm depend on its interactions with other firms.

Globalization The process of countries becoming more open to foreign trade and investment.

H

Health care Goods and services, such as prescription drugs, consultations with doctors, and surgeries, that are intended to maintain or improve a person's health.

Health insurance A contract under which a buyer agrees to make payments, or *premiums*, in exchange for the provider's agreeing to pay some or all of the buyer's medical bills.

Horizontal merger A merger between firms in the same industry.

Human capital The accumulated knowledge and skills that workers acquire from education and training or from their life experiences.

I

Illegal market A market in which buying and selling take place at prices that violate government price regulations.

Implicit cost A nonmonetary opportunity cost.

Imports Goods and services purchased domestically that are produced in other countries.

Income effect The change in the quantity demanded of a good that results from the effect of a change in price on consumer purchasing power, holding all other factors constant.

Income elasticity of demand A measure of the responsiveness of the quantity demanded to changes in income, measured by the percentage change in the quantity demanded divided by the percentage change in income.

Income statement A financial statement that shows a firm's revenues, costs, and profit over a period of time.

Indifference curve A curve that shows the combinations of consumption bundles that give the consumer the same utility.

Indirect finance A flow of funds from savers to borrowers through financial intermediaries such as banks. Intermediaries raise funds from savers to lend to firms (and other borrowers).

Inelastic demand The case where the percentage change in quantity demanded is *less* than the percentage change in price, so the price elasticity is *less* than 1 in absolute value.

Inferior good A good for which the demand increases as income falls and decreases as income rises.

Interest rate The cost of borrowing funds, usually expressed as a percentage of the amount borrowed.

L

Labor union An organization of employees that has a legal right to bargain with employers about wages and working conditions.

Law of demand A rule that states that, holding everything else constant, when the price of a product falls, the quantity demanded of the product will increase, and when the price of a product rises, the quantity demanded of the product will decrease.

Law of diminishing marginal utility The principle that consumers experience diminishing additional satisfaction as they consume more of a good or service during a given period of time.

Law of diminishing returns The principle that, at some point, adding more of a variable input, such as labor, to the same amount of a fixed input, such as capital, will cause the marginal product of the variable input to decline.

Law of supply A rule that states that, holding everything else constant, increases in price cause increases in the quantity supplied, and decreases in price cause decreases in the quantity supplied.

Liability Anything owed by a person or a firm.

Limited liability A legal provision that shields owners of a corporation from losing more than they have invested in the firm.

Long run The period of time in which a firm can vary all its inputs, adopt new technology, and increase or decrease the size of its physical plant.

Long-run average cost curve A curve that shows the lowest cost at which a firm is able to produce a given quantity of output in the long run, when no inputs are fixed.

Long-run competitive equilibrium The situation in which the entry and exit of firms has resulted in the typical firm breaking even.

Long-run supply curve A curve that shows the relationship in the long run between the market price and the quantity supplied.

Lorenz curve A curve that shows the distribution of income by arraying incomes from lowest to highest on the horizontal axis and indicating the cumulative fraction of income earned by each fraction of households on the vertical axis.

M

Macroeconomics The study of the economy as a whole, including topics such as inflation, unemployment, and economic growth.

Marginal analysis Analysis that involves comparing marginal benefits and marginal costs.

Marginal benefit The additional benefit to a consumer from consuming one more unit of a good or service.

Marginal cost The change in a firm's total cost from producing one more unit of a good or service.

Marginal product of labor The additional output a firm produces as a result of hiring one more worker.

Marginal productivity theory of income distribution The theory that the distribution of income is determined by the marginal productivity of the factors of production that individuals own.

Marginal rate of substitution (*MRS*) The rate at which a consumer would be willing to trade off one good for another.

Marginal revenue (*MR*) The change in total revenue from selling one more unit of a product.

Marginal tax rate The fraction of each additional dollar of income that must be paid in taxes.

Marginal utility (*MU*) The change in total utility a person receives from consuming one additional unit of a good or service.

Market A group of buyers and sellers of a good or service and the institution or arrangement by which they come together to trade.

Market-based reforms Changes in the market for health care that would make it more like the markets for other goods and services.

Market demand The demand by all the consumers of a given good or service.

Market economy An economy in which the decisions of households and firms as they interact in markets determine the allocation of economic resources.

Market equilibrium A situation in which quantity demanded equals quantity supplied.

Market failure A situation in which the market fails to produce the efficient level of output.

Market power The ability of a firm to charge a price greater than marginal cost.

Marketing All the activities necessary for a firm to sell a product to a consumer.

Median voter theorem The proposition that the outcome of a majority vote is likely to represent the preferences of the voter who is in the political middle.

Microeconomics The study of how households and firms make choices, how they interact in markets, and how the government attempts to influence their choices.

Minimum efficient scale The level of output at which all economies of scale are exhausted.

Mixed economy An economy in which most economic decisions result from the interaction of buyers and sellers in markets but in which the government plays a significant role in the allocation of resources.

Monopolistic competition A market structure in which barriers to entry are low and many firms compete by selling similar, but not identical, products.

Monopoly A firm that is the only seller of a good or service for which there is not a close substitute.

Monopsony The situation in which a firm is the sole buyer of a factor of production.

Moral hazard Actions people take after they have entered into a transaction that make the other party to the transaction worse off.

N

Nash equilibrium A situation in which each firm chooses the best strategy, given the strategies chosen by other firms.

Natural disaster (in an economic context) A hurricane, flood, or similar act of nature that causes damage to stores, factories, or office buildings.

Natural monopoly A situation in which economies of scale are so large that one firm can supply the entire market at a lower average total cost than can two or more firms.

Network externality A situation in which the usefulness of a product increases with the number of consumers who use it.

Noncooperative equilibrium An equilibrium in a game in which players do not cooperate but pursue their own self-interest.

Normal good A good for which the demand increases as income rises and decreases as income falls.

Normative analysis Analysis concerned with what ought to be.

O

Oligopoly A market structure in which a small number of interdependent firms compete.

Opportunity cost The highest-valued alternative that must be given up to engage in an activity.

P

Pandemic (in an economic context) A situation in which a disease becomes sufficiently widespread as to significantly affect economic activity.

Partnership A firm owned jointly by two or more persons and not organized as a corporation.

Patent The exclusive legal right to produce a product for a period of 20 years from the date the patent application is filed with the government.

Payoff matrix A table that shows the payoffs that each firm earns from every combination of strategies by the firms.

Perfectly competitive market A market that meets the conditions of having (1) many buyers and sellers, (2) all firms selling identical products, and (3) no barriers to new firms entering the market.

Perfectly elastic demand The case where the quantity demanded is infinitely responsive to price and the price elasticity of demand equals infinity.

Perfectly inelastic demand The case where the quantity demanded is completely unresponsive to price and the price elasticity of demand equals zero.

Personnel economics The application of economic analysis to human resources issues.

Pigovian taxes and subsidies Government taxes and subsidies intended to bring about an efficient level of output in the presence of externalities.

Positive analysis Analysis concerned with what is.

Poverty line A level of annual income equal to three times the amount of money necessary to purchase the minimum quantity of food required for adequate nutrition.

Poverty rate The percentage of the population that is in poverty, according to the federal government's definition.

Present value The value in today's dollars of funds to be paid or received in the future.

Price ceiling A legally determined maximum price that sellers may charge.

Price discrimination The practice of charging different prices to different customers for the same good or service when the price differences are not due to differences in cost.

Price elasticity of demand The responsiveness of the quantity demanded to a change in price, measured by dividing the percentage change in the quantity demanded of a product by the percentage change in the product's price.

Price elasticity of supply The responsiveness of the quantity supplied to a change in price, measured by dividing the percentage change in the quantity supplied of a product by the percentage change in the product's price.

Price floor A legally determined minimum price that sellers may receive.

Price leadership A form of implicit collusion in which one firm in an oligopoly announces a price change and the other firms in the industry match the change.

Price taker A buyer or seller that is unable to affect the market price.

Principal–agent problem A problem caused by an agent pursuing the agent's own interests rather than the interests of the principal who hired the agent.

Prisoner's dilemma A game in which pursuing dominant strategies results in noncooperation that leaves everyone worse off.

Private benefit The benefit received by the consumer of a good or service.

Private cost The cost borne by the producer of a good or service.

Private good A good that is both rival and excludable.

Producer surplus The difference between the lowest price a firm would be willing to accept for a good or service and the price it actually receives.

Product market A market for goods—such as computers—or services—such as medical treatment.

Production function The relationship between the inputs employed by a firm and the maximum output the firm can produce with those inputs.

Production possibilities frontier (*PPF*) A curve showing the maximum attainable combinations of two goods that can be produced with available resources and current technology.

Productive efficiency A situation in which a good or service is produced at the lowest possible cost.

Profit Total revenue minus total cost.

Progressive tax A tax for which people with lower incomes pay a lower percentage of their income in tax than do people with higher incomes.

Property rights The rights individuals or businesses have to the exclusive use of their property, including the right to buy or sell it.

Protectionism The use of trade barriers to shield domestic firms from foreign competition.

Public choice model A model that applies economic analysis to government decision making.

Public franchise A government designation that a firm is the only legal provider of a good or service.

Public good A good that is both nonrival and nonexcludable.

Q

Quantity demanded The amount of a good or service that a consumer is willing and able to purchase at a given price.

Quantity supplied The amount of a good or service that a firm is willing and able to supply at a given price.

Quota A numerical limit that a government imposes on the quantity of a good that can be imported into the country.

R

Regressive tax A tax for which people with lower incomes pay a higher percentage of their income in tax than do people with higher incomes.

Rent seeking Attempts by individuals and firms to use government action to make themselves better off at the expense of others.

Risk The degree of uncertainty in the return on an asset.

Rivalry The situation that occurs when one person's consumption of a unit of a good means no one else can consume it.

S

Scarcity A situation in which unlimited wants exceed the limited resources available to fulfill those wants.

Separation of ownership from control A situation in a corporation in which the top management, rather than the shareholders, controls day-to-day operations.

Short run The period of time during which at least one of a firm's inputs is fixed.

Shortage A situation in which the quantity demanded is greater than the quantity supplied.

Shutdown point The minimum point on a firm's average variable cost curve; if the price falls below this point, the firm shuts down production in the short run.

Single-payer health care system A system, such as the one in Canada, in which the government provides health insurance to all of the country's residents.

Social benefit The total benefit from consuming a good or service, including both the private benefit and any external benefit.

Social cost The total cost of producing a good or service, including both the private cost and any external cost.

Socialized medicine A health care system under which the government owns most of the hospitals and employs most of the doctors.

Sole proprietorship A firm owned by a single individual and not organized as a corporation.

Statistical discrimination The practice of assigning the characteristics of a group to an individual who belongs to the group.

Stock A financial security that represents partial ownership of a firm.

Substitutes Goods and services that can be used for the same purpose.

Substitution effect The change in the quantity demanded of a good that results from a change in price making the good more or less expensive relative to other goods, holding constant the effect of the price change on consumer purchasing power.

Sunk cost A cost that has already been paid and cannot be recovered.

Supply curve A curve that shows the relationship between the price of a product and the quantity of the product supplied.

Supply schedule A table that shows the relationship between the price of a product and the quantity of the product supplied.

Surplus A situation in which the quantity supplied is greater than the quantity demanded.

T

Tariff A tax imposed by a government on imports.

Tax incidence The actual division of the burden of a tax between buyers and sellers in a market.

Technological change A positive or negative change in the ability of a firm to produce a given level of output with a given quantity of inputs.

Technology The processes a firm uses to turn inputs into outputs of goods and services.

Terms of trade The ratio at which a country can trade its exports for imports from other countries.

Total cost The cost of all the inputs a firm uses in production.

Total revenue The total amount of funds a seller receives from selling a good or service, calculated by multiplying price per unit by the number of units sold.

Trade The act of buying and selling.

Trade-off The idea that, because of scarcity, producing more of one good or service means producing less of another good or service.

Tragedy of the commons The tendency for a common resource to be overused.

Transactions costs The costs in time and other resources that parties incur in the process of agreeing to and carrying out an exchange of goods or services.

U

Unit-elastic demand The case where the percentage change in quantity demanded is *equal to* the percentage change in price, so the price elasticity is equal to 1 in absolute value.

Utility The enjoyment or satisfaction people receive from consuming goods and services.

V

Value of the marginal product of labor (*VMPL*) The change in a firm's revenue as a result of hiring one more worker.

Variable costs Costs that change as output changes.

Vertical merger A merger between firms at different stages in the production of a good.

Voluntary exchange A situation that occurs in markets when both the buyer and the seller of a product are made better off by the transaction.

Voluntary export restraint (VER) A restriction on the quantity of a good that can be imported by one country from another country.

Voting paradox The failure of majority voting to always result in consistent choices.

W

Wall Street Reform and Consumer Protection Act (Dodd-Frank Act) Legislation passed during 2010 that was intended to reform regulation of the financial system.

World Trade Organization (WTO) An international organization that oversees international trade agreements.

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